LONGITUDINAL STUDY OF VOCAL CHARACTERIZATION IN CHORAL SINGING

Estudo longitudinal de caracterização vocal em canto coral

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ABSTRACT

Purpose: to verify what the benefits of choral singing for the improvement of vocal patterns pre and post singing activity. **Methods:** in three different times in one year, data were collected on signs and symptoms vocals, voice recordings for auditory perception and acoustic analysis, with fundamental frequency, jitter, shimmer, glottal noise, as well as the vocal range and maximum phonation time. The sample consisted of 23 amateur singers in a university choir, belongs to the Federal University of Health Sciences of Porto Alegre. The statistical analysis consisted of crossing data at different stages of evaluation. **Results:** it was observed that the majority of singers has no inadequate patterns when it comes to the use of their voices. There was improvement in awareness of use and vocal care and in acoustic parameters. **Conclusion:** within one year of measurement, it was verified that the practice of choir singing brought vocal benefits for individuals, through developments and improvements individual in phonation.

KEYWORDS: Singing; Speech, Language and Hearing Sciences; Voice; Music

INTRODUCTION

The voice is the sound produced predominantly in expiration, through the vocal folds adduction and refined by the speech organs, such as the palate, tongue, teeth, lips and nose[1]. Differential parameters can be observed in the singing and speaking voice, as such: respiration, phonation, vocal quality, vibrato, resonance and voice projection, articulation of speech sounds, pauses and body posture. In short, the spoken voice is valued by the intelligibility of the text, not in sound and audio quality that is presented. On the contrary, the singing voice is at times valued with moments of text unintelligibility deliberately performed with the purpose of reaching the sound quality intended[2].

In Brazil, there is an immense variety of amateur and professional choral groups. A survey with 150 regents from the State of São Paulo indicates that 97.9% of the studied chorals are amateurs. This demonstrates the great field of activity there is within reach of speech pathologist practitioners[3,4]. In a choir group, speech therapists not only can act performing group work, but also provide individual support to singers. Additionally, they can develop vocal awareness activities such as lectures and workshops. Moreover, they can perform warm ups before and cool downs after rehearsals which are important to maintain a healthy voice. Furthermore, they have the capability of evaluating and monitoring all voices in the entire choir[5].

In the adult choir, it is observed a division of voices in four groups, called suits. There are two male suits, tenors and basses, and two female suits, sopranos and altos, representing respectively high and low pitch voices of each gender. The interim vocal ratings, baritone, male voice, and mezzo-soprano, female voice, are hardly separated in suits, like the others, only being requested in more complex and advanced choirs[5,6] .

The speech assessment involves specific execution such as auditory-perceptual evaluation and computerized acoustic analysis. In the auditory-perceptual assessment, the listener and evaluator will define how the individual uses his voice indicating the laryngeal vocal ability and the characteristics of the vocal tract and its articulators. In other words, what is the overall impression of

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Conflict of interest: non-existent

filter usage and glottal source[1-7]. Despite this type of voice evaluation being considered subjective, as it depends on the auditory training of the evaluator, it is a traditionally basic tool and reference in speech therapy as it ascertains the progress of the treatment, facilitates the understanding of vocal organs physiology directing the speech therapy, it sensitizes the individual to their need to behavioral change, and it also clarifies causal factors of disorder[1,8]. To measure the auditory-perceptual assessment in a standardized way, numerical scales were organized and validated through vocal classification. Among them, two are widely used in clinical practice and vocal research, GRBASI[9] and CAPE-V[10].

The acoustic analysis is the extraction and quantification process of vocal signal by means of objective instruments. This assessment provides indirect measurements on the vocal cords vibratory patterns, potential vocal tract adjustments, and its changes over time. Its interpretation varies according to age, gender, type of phonation, and vocal training[7-11]. Among the various acoustic measurements that voice laboratories can offer, some are more applied because they offer a more reliable voice quality description like: fundamental frequency, jitter, shimmer and glottal noise (GNE - glottal Noise Excitation)[1].

Vocal range, which is the number of notes that an individual has, from the lower note to the more acute, and the maximum phonation time, the amount of time that they can sustain note, word or phrase with only one breathing, is of utmost importance in the activity of choral singing for speech therapy. If using these factors the individual can sing a larger amount of notes, in a greater amount of time, this may help him interpreting and singing[1,6].

Vocal assessment protocols have now been presented as a basis for the creation of specific questionnaires in speech therapy, both spoken and singing voice[1]. This guides the professional to develop protocols, which will provide relevant data on the vocal behavior of the singer. Through these questionnaires it is possible to identify signs and vocal symptoms that may indicate improper speech behavior or even a vocal pathology signal. There are protocols for this purpose in the literature, where there is a cutoff point (number of signals) considered normality standard[1,2,12].

This research aimed to verify what are the benefits of choral singing for improvements on pre and post vocal emission standards.

METHODS

This research is cross-longitudinal and it was approved by the Research Ethics Committee of the Health Sciences department in the Federal University of Porto Alegre (UFCSPA) with 029/12 record. All subjects were instructed about the research and were asked to sign the Free Consent Term in accordance with current regulations.

The work evaluates vocal aspects of a choral belonging to UFCSPA. The development of the research was conducted at three different stages (step 1 - ET1; step 2 - ET2, and Step 3 - ET3) within one year, in order to assess the development of vocal aspects with the practice of choral singing. The sample consisted of 23 people (14 female and 9 male) members of Coral UFCSPA who expressed interest in collaborating with the research, thus defining a sampling by convenience. The interval between the evaluation stages was approximately six months.

It was considered as inclusion criteria: participate in the UFCSPA Choral more frequently than 75% of all rehearsals; receive clarification notice regarding the research, signing the informed consent form authorizing the use of data in the study; and to be at least 18 years old; as exclusion criteria, individuals who did not meet the above requirements.

The UFCSPA Choral is amateur, not having a test for admission, just a vocal classification. University students, teachers, institution staff, and people from the community compose it. Rehearsals take place at the University with a weekly frequency and duration of approximately 1 hour and 30 minutes. The choir is part of a Pro Dean Project University Extension. Under faculty guidance of a specialist in voice, speech therapy tutors perform warm ups and cool downs in all rehearsals.

During the data collection process, voice recordings were taken for acoustic and perceptual analysis, vocal range, maximum phonation time (TMF), and the questionnaire signs and vocal symptoms were applied.

The survey was developed by the researcher based on a questionnaire of vocal signs and symptoms already validated[12]. This was sent by e-mail, using Google's Drive automated petition form and data storage. The assessment procedure involving voices perceptual analysis, included recording a sustained habitual emission of vowels /a, i/, count from 1 to 10 and singing "Happy Birthday". During the assessments subjects remained standing. Voice analysis was performed by GRBASI[9] scale by two speech pathologists judges, blinded to the condition of the sample. The voices were presented randomly and individually by randomizing cases and controls. To obtain the acoustic analysis data, it was recorded the issuance of the sustained vowel /ɛ/, and extracted the fundamental frequency measures

(f_0), jitter, shimmer and noise level (ratio GNE) using VoxMetria software - *CTS Informática*, version 4.0.

The two recordings taken (perceptual and acoustic analysis) occurred in silent environment with microphone Shure SM58 brand model, and a pedestal aid to support, directly in digital recorder. A distance was maintained between the microphone and the participant's mouth, 5 cm to sustained vowels, and 10 cm for sequential speech.

For vocal range evaluation, it was used an Yamaha keyboard, PSR-E213 model, in which it obtained the lowest and highest note reached by the subject without detuning during broadcast. In this regard, during the evaluation, the notes were selected before the person entered into falsetto zone and basal register. In the maximum phonation time (TMF) all vowels (a, ɛ, i, ɔ, u) were requested to be issued plus the phonemes /s, z/.

Statistical analysis was performed using SPSS software version 19. The Shapiro-Wilk test was used to verify the normality of variance for continuous variables. For categorical variables, data was described in absolute and relative value; due to the reduced number of continuous variables with normal distribution, variables will be presented by accompanied minimum and maximum mean value. The inferential analysis was performed through variable comparisons during the three evaluation periods. The Wilcoxon U test was used to compare intragroup means, and the Mc Nemar test to compare the frequency of symptoms in each stage of the study. It was considered the 5% significance level. Analyses relating to the questionnaire of vocal signs and symptoms were compared, no gender differentiation. The other collected data were analyzed amongst each other and with gender differentiation.

Description of the data collection steps

ET1: held in the winter of 2012, it included all participants who had shown initial interest in participating in the research.

ET2: held in the summer of 2012-2013, included participants who expressed interest in staying in the research and who satisfied the inclusion and exclusion criteria.

ET3: held in winter 2013, featured participants who expressed interest in staying in the research and who satisfied the inclusion and exclusion criteria.

All data was equally collected in the three stages, with the exception of vocal signs and symptoms questionnaire, which was collected only on steps 1 and 3. Data collection occurred in the Voice and Speech Lab at the university.

RESULTS

Over the large number of variables collected, the results were separated into two groups as to be better observed. Firstly, questionnaire results of voice signs and symptoms are exposed, which were applied in steps 1 and 3, and then the results of other evaluations, applied in three steps. In each stage there was variation in the sample amount. In ET1, 80 subjects were initiated, 30 subjects remained in ET2, and finally 23 subjects in ET3.

Questionnaire of vocal signs and symptoms

Fifteen subjects (65.2%) are students, and the entire sample average age is 26.48 years old (DP 6.16). Most participants (82.6%), had not sung in a choir before joining the institution Choral, and also had not undergone speech therapy (91.3%). Figure 1 shows the sample distribution by voice classification in each step, Figure 2 shows the found relationship between vocal signals and symptoms, and Table 1 shows the statistical relationship related to vocal signals and symptoms.

In ET1, 21.7% of the subjects noticed a change in their voice throughout the day; in ET3 34.8% did not notice changes, followed by the same number reported having felt that the voice alters with temperature changes. Eighteen subjects (78.3%) reported that their voices came out effortlessly during the test in ET1 and in ET3 this figure rose to 91.3% ($p = 0.019$). Regarding foreign body sensations, scratches, bites, pain or irritation in the larynx during singing, 26.1% felt at least one symptom in ET1 compared to 21.74% in ET3. The most referred sensation was that of "scratches" (17.4% for both phases; $p = 0.038$). Table 2 presents pain or strain regions reported by subjects in their daily routine.

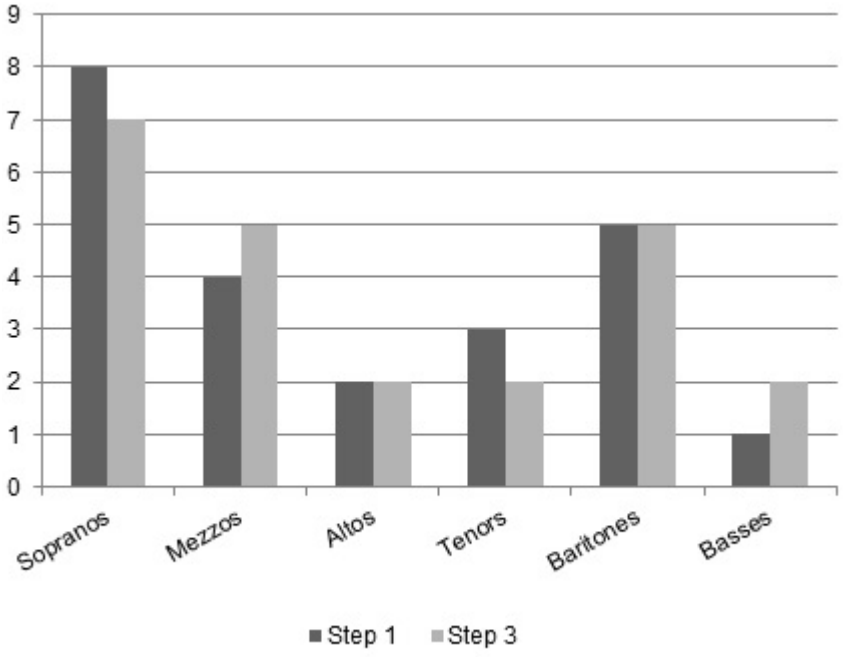
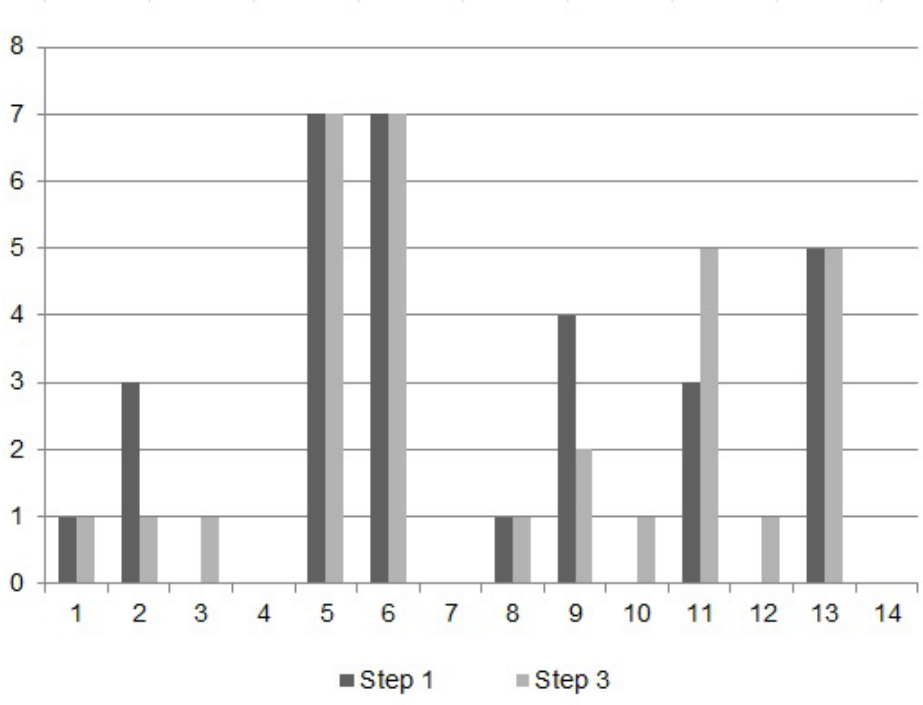


Figure 1 – Number of subject classified by vocal sample in steps 1 and 3 of the data collection



1 - Hoarseness; 2 - Voice tires or changes quality after short use; 3 - Trouble speaking or singing softly; 4 - Effort to talk; 5 - Difficulty projecting voice; 6 - Loss of singing range; 7 - Discomfort while using voice; 8 - A monotone voice; 9 - Chronic throat dryness; 10 - Swallowing difficulties; 11 - Frequent throat clearing; 12 - Bitter or acid taste; 13 - A wobbly or shaky voice; 14 – Chronic throat soreness

Figure 2 – Quantity of Vocal Signs and Symptoms by Roy (2004) in steps 1 and 3 of the data collection

Table 1 – Significance Values for Vocal Signs and Symptoms by Roy (2004) relating between steps 1 and 3 of data collection

Variable	Subject Amount (%) step 1	Subject Amount (%) step 3	Value p
1	1 (4,3%)	1 (4,3%)	1
2	3 (13%)	1 (4,3%)	0,5
3	0	1 (4,3%)	NA
4	0	0	NA
5	7 (30,4%)	7 (30,4%)	1
6	7 (30,4%)	7 (30,4%)	1
7	0	0	NA
8	1 (4,3%)	1 (4,3%)	1
9	4 (17,4%)	2 (8,7%)	0,625
10	0	1 (4,3%)	NA
11	3 (13%)	5 (21,7%)	0,687
12	0	1 (4,3%)	NA
13	5 (21,7%)	5 (21,7%)	1
14	0	0	1

Mc Nemar test. Significant results at p <0.05
NA – not applicable statistical test (one of the values is equal to 0)
1 - Hoarseness; 2 - Voice tires or changes quality after short use; 3 - Trouble speaking or singing softly; 4 - Effort to talk; 5 - Difficulty projecting voice; 6 - Loss of singing range; 7 - Discomfort while using voice; 8 - A monotone voice; 9 - Chronic throat dryness; 10 - Swallowing difficulties; 11 - Frequent throat clearing; 12 - Bitter or acid taste; 13 - A wobbly or shaky voice; 14 – Chronic throat soreness

Eight subjects (34.8%) present at least one respiratory disease in both stages. The most prevalent diseases were rhinitis (ET1 - 47.8% / ET3 - 56.5% / p = 0.002) and sinusitis (ET1 - 34.8% / ET3 - 39.1% / p = 0.001). Referring to vocal health habits, in ET1 30.4% performed vocal warm ups regardless of the regent's presence or stimulus, subsequently in the ET3 that number changed significantly (p = 0.026) to 43.5%. The water intake during the rehearsals occurred only when subjects believed to be strictly necessary (30.4% in ET1 and ET3 at 39.1%). The number of subjects who took vocal activities, such as speech therapy, speech diction, singing lessons and theater, also increased (34.78% to 43.48% in ET1 and ET3 respectively / p = 0.000), singing lesson being the most recurrent (26.08% to 43.48% in ET1).

Table 2 – Overview of muscle pain in daily routine and their significance level

Region pain or tension	Subject Amount (%) step 1	Subject Amount (%) step 3	Value p
Head	3 (13%)	3 (13%)	1
Throat	2 (8,7%)	2 (8,7%)	1
Shoulders	11 (47,8%)	8 (34,8%)	0,250
Face	2 (8,7%)	0	NA
Back	7 (30,4%)	10 (43,5%)	0,453
Tongue	0	0	NA
Jaw	2 (8,7%)	2 (8,7%)	1
Nape	7 (30,4%)	8 (34,8%)	1
Neck	10 (43,5%)	8 (34,8%)	0,754

Mc Nemar test. Significant results at p <0.05
NA – not applicable statistical test (one of the values is equal to 0)

Other evaluations

The vocal range found in the research, along with the vocal classification stipulated by the conductor of the choir was compared with Tonal Vocal Assessment Correspondents Table[13] and resulted in 73.9% agreement with ET1; 69.3% agreement with ET2 and 100% agreement with ET3. In the inferential analysis, there was only significance between steps 1 and 2 (p = 0.003). Other data are listed on the following Tables.

Table 3 – Mean values with minimum and maximum fundamental frequency, maximum phonation time, amount of semitones and vocal range by gender and research steps

			Males			Females		
			Med.	**Min.**	**Max.**	**Med.**	**Min.**	**Max.**
Fundamental Frequency - Hz	Step 1		121,3	104,84	215,55	208,175	177,66	247,32
	Step 2		131,33	111,17	158,76	220,125	184,45	242,52
	Step 3		131,54	119,57	158,08	233,26	211,95	264,46
Maximum Phonation Time - s	Step 1		16,41	9,32	22,39	10,92	6,19	13,87
	Step 2		18,09	8,86	28,22	12,52	8,72	17,33
	Step 3		16,20	7,36	34,71	14,09	7,28	22,1
Amount of Semitones	Step 1		27	21	36	24,5	13	32
	Step 2		24	20	31	24	17	35
	Step 3		24	14	32	25	22	34
Vocal Range – Hz	Step 1	LP	98	72,5	116,5	185,5	147	196
		HP	416	349	659	678,5	392	880
	Step 2	LP	98	62	116,5	165	123	247
		HP	370,5	330	494	698	494	988
	Step 3	LP	165	110	196	196	147	247
		HP	555	392	784	856	587	988

Med. = Median
Min. = Minimum value
Max. = Maximum value
LP = Lowest Frequency
HP = Highest Frequency

Table 4 – Significance values for fundamental frequency, maximum phonation time, amount of semitones and vocal range related to gender and research steps

			GM	GF
Step 1 and Step 2	Fundamental frequency		p = 0,859	p = 0,124
	Maximum phonation time		p = 0,139	p = 0,087
	Vocal range	LP	p = 0,574	p = 0,722
		HP	p = 0,767	p = 0,223
	Amount of semitones		p = 0,138	p = 0,570
Step 2 and Step 3	Fundamental frequency		p = 0,767	p = 0,013*
	Maximum phonation time		p = 0,859	p = 0,006*
	Vocal range	LP	p = 0,012*	p = 0,142
		HP	p = 0,013*	p = 0,006*
	Amount of semitones		p = 0,624	p = 0,107
Step 1 and Step 3	Fundamental frequency		p = 0,515	p = 0,008*
	Maximum phonation time		p = 0,441	p = 0,011*
	Vocal range	LP	p = 0,008*	p = 0,288
		HP	p = 0,051*	p = 0,002*
	Amount of semitones		p = 0,123	p = 0,032*

GM = Males
GF = Females
LP = Lowest Frequency
HP = Highest Frequency
* = Statistically significant results (Wilcoxon's U test, p <0.05)

Table 5 – Mean values, minimum and maximum for the proportion glottal noise excitation, jitter, shimmer and s/z ratio by gender and research steps

		Males			Females		
		Med.	Min.	Max.	Med.	Min.	Max.
Proportion GNE	Step 1	0,95	0,82	0,97	0,91	0,71	0,96
	Step 2	0,85	0,43	0,95	0,885	0,62	0,96
	Step 3	0,84	0,53	0,96	0,82	0,50	0,96
Jitter	Step 1	0,10	0,07	0,26	0,185	0,10	0,41
	Step 2	0,15	0,00	0,28	0,135	0,07	0,50
	Step 3	0,19	0,08	0,25	0,20	0,09	1,29
Shimmer	Step 1	4,60	2,81	6,88	2,73	1,86	5,36
	Step 2	5,18	3,84	7,35	3,26	2,26	5,52
	Step 3	4,28	2,66	8,41	3,45	1,59	6,75
Ratio s/z	Step 1	1,094	0,63	1,35	1,01	0,60	1,62
	Step 2	0,87	0,78	1,49	0,93	0,67	1,77
	Step 3	0,89	0,82	1,79	1,03	0,72	1,78

Med. = Median
Min. = Minimum value
Max. = Maximum value

Table 6 – Significance values for proportion glottal noise excitation, jitter, shimmer and s/z ratio relating with gender and research steps

		Males	Females
Step 1 e Step 2	Proportion GNE	p = 0,018*	p = 0,432
	Jitter	p = 0,342	p = 0,330
	Shimmer	p = 0,066	p = 0,397
	Ratio s/z	p = 0,314	p = 0,638
Step 2 e Step 3	Proportion GNE	p = 0,859	p = 0,157
	Jitter	p = 0,310	p = 0,135
	Shimmer	p = 0,110	p = 0,331
	Ratio s/z	p = 0,678	p = 0,363
Step 1 e Step 3	Proportion GNE	p = 0,042*	p = 0,059*
	Jitter	p = 0,097	p = 0,972
	Shimmer	p = 0,722	p = 0,198
	Ratio s/z	p = 0,859	p = 0,551

* = Statistically significant results (Wilcoxon's U test, p <0.05)

DISCUSSION

The challenge of learning how to sing involves a diverse range of organic, technical and psychological factors[2]. For singers, the instrument is their voice; they must perceive and improve themselves with it, so that the final result may transpire what the composer imagined. Group singing is no exception to this rule, and since there is a strong plurality in choirs, the members are required to have greater commitment, after all reaching a sound unit is quite complicated[4,5].

In the studied group, during the research development, there was constant exchange of choristers[2,5]. This justifies the fact that the sample decreased over time. Change can be observed in the number of subjects in each suit due to the fact that the conductor led new trials in different periods of the year.

It was observed a prevalence of 14 vocal signs and symptoms, which when present in the subject's complaint, may suggest a functional imbalance in voice production[12,14]. By observing Figure 2, the results showed that the average symptoms of the studied group are within normal range, although it disagrees with the literature findings about the most common symptoms, which were: dry throat, hoarseness, vocal fatigue and throat clearing. However, the research group was a sample of basic educational teachers where vocal demand is primarily spoken. Conversely, for this research, singers were investigated, although the majority were amateurs, they require a different vocal demand since it is known that singing voice requires prior training and greater voice awareness, unlike spoken voice[5]. Another research[15] demonstrates that 45% of their sample showed between 1 and 2 vocal symptoms, including the difficulty of singing in high-pitched tones.

When singers start their activities, they can choose different ways to reach vocal control, where active effort is no longer needed. This path varies for each individual, but progress always occurs[16]. So, it was observed over time, the increasing amount of subjects (91.3%) who reported not making any efforts at the time of singing, thus demonstrating that they were able to learn with choral singing how to practice and enjoy the best capabilities of their vocal tract.

Also, within the singing learning process, it is possible to highlight the importance of vocal health awareness. This goes beyond voice care, it also encompasses vocal physiology and understanding about factors that can impair the singing or speaking voice. The absence of specific voice care practices can bring harm to the singer's voice, both short and long term[2,5]. In this research we can observe positive and negative aspects about the quality of noise emission. The presence of roughness during singing, and changes in voice during a regular day, under the influence of sudden temperature changes, can be considered negative aspects, however, other data also point in a different direction. The increase number of subjects who performed voice warm ups, water intake, specific care of the voice and increased demand for professional vocal activities show the growing awareness about the issue.

This research also verified the occurrence of complaints related to muscle pain or tension. Table 2 shows that a lot of subjects reported pain or muscle tension in the neck or shoulder girdle,

which are characteristic of dysphonia by musculoskeletal tension. This dysphonia arises not by vocal folds pathology, but by tension in the extrinsic larynx muscles. The recurrence of these symptoms, combined with vocal exertion can lead to such dysphonia[1,17,18]. Another important aspect is related to airways infection, which is common in southern Brazil due to constant climatic changes[19,20]. One of the most recurrent infections is rhinitis, which can affect up to 20% of the general population. During data collection, a lot of subjects presented airways deviation, which can be considered a bias in the survey, since this obstruction can cause impairment of vocal emission[1,21,22].

In the acoustic parameters adopted for the survey, which can be observed in Tables 3, 4, 5 and 6, the mean results, for both sexes, they were within the normal range established in the literature[1,2,5,23]. In the vocal range parameter, there was agreement between the results found by the researcher and the vocal classification made by the conductor. When we stratified the sample by gender, it was observed that the variables of tables 3 and 4, fundamental frequency, maximum phonation time, vocal range and quantity of semitones, showed significant values only for females, and for a year worth of comparison. A research reported significant results with a shorter amount of time and work, but their proposal was an active intervention by the speech therapist, unlike this research[4]. The male segment of the research showed significance only in vocal range, which may be due to sample size. Referring to the data of the fundamental frequency disturbance in the short term, jitter and shimmer (Tables 5 and 6), the results were not significant, although within normal range, thus indicating that the practice of singing does not cause voice harm in a short period of time[1-5]. The s/z ratio can also be allocated in this group, since there was no variation of it during the research. The significant noise measurement reduction proposed in the research, the proportion GNE also verifies previous statements, although other research has found stability in this variable[11].

Referring to auditory-perceptual assessment, in the 3 stages collected, most of the subjects received index 0 in the general level assessment, which represents no change. Some sporadic cases received assessment that matches one slight change. Statistical analysis did not get significant value. This shows a positive factor related to choral singing activity, which contributed to the maintenance and improvement of the subjects' voices.

Reflecting on the findings of this study, it is suggested that in the future the sample size is greater than the current one. Even though the authors point to benefits of choral singing practice for voice longevity[4,24], a potentially larger sample could bring greater verification significance of the results described in the literature.

CONCLUSION

This research concludes that it is not simply learning how to sing, but also developing new relationships within the context of the activity creating specialized informational webs for better results, like voice awareness and vocal care. Choral singing practice can develop, improve and restore the voice. From the observed changes, it also consolidates the practice of choral singing showing benefits to the subjects of this research in all evaluated parameters. Thus, the act of singing is an excellent exercise to improve longevity, health and vocal plasticity.

ACKNOWLEDGEMENTS

To colleagues Tanise Cristaldo Anhaia, and Karoline Weber dos Santos for their collaboration, motivation and companionship throughout the research process.

RESUMO

Objetivo: verificar quais os benefícios do canto coral para o aprimoramento dos padrões de emissão vocal pré e pós atividade de voz cantada. **Métodos:** em três diferentes etapas, no período de um ano, foram coletados dados de sinais e sintomas vocais, registros de voz para análise perceptivo-auditiva e acústica, com os parâmetros de frequência fundamental, jitter, shimmer e ruído glótico, assim como a extensão vocal e o tempo máximo de fonação. A amostra foi composta por 23 cantores amadores de um coral universitário pertencente à Universidade Federal de Ciências da Saúde de Porto Alegre. A análise estatística consistiu de cruzar os dados em diferentes etapas de avaliação. **Resultados:** observou-se que a maioria dos cantores não apresentou padrões inadequados de uso vocal. Houve melhora da consciência de uso e cuidados vocais e de parâmetros de análise acústica. **Conclusão:** no período de um ano de mensuração, foi possível verificar que a prática de canto coral trouxe benefícios vocais aos sujeitos por meio do desenvolvimento e aprimoramento individual da emissão vocal.

DESCRITORES: Canto; Fonoaudiologia; Voz; Música

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http://dx.doi.org/10.1590/1982-021620151761515
Received on: February 03, 2015
Accepted on: June 16, 2015

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