

CHARACTERIZATION OF THE VOCAL ASPECTS OF A CHOIR OF CHILDREN AND TEENAGERS

Caracterização dos aspectos vocais de um coro infantojuvenil

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ABSTRACT

Purpose: to characterize the vocal health, knowledge of choristers in caring for her own voice, and perceptual analysis of the spoken voice, performed by an audiologist in a chorus children and youth.

Methods: the study included 20 individuals of both sexes, between 10 and 18 years, members of a choir, two questionnaires were applied: one facing parents on general health, medical and dietary habits, and another for the choristers facing experience in singing, knowledge of the voice and vocal health habits. Screening was performed for individual vocal perceptual analysis of the spoken voice.

Results: in the questionnaire back to the parents, it was observed that 40% of the choristers had some kind of allergy, whereas in the questionnaire aimed to choristers, 65% did not know how the voice is produced; carried out vocal training 100%, 80% did not care voice, 35% had vocal complaints; already screening vocal assessed that 35% expressed hoarse and breathy and rough 5%, the pitch was found predominantly acute (55%); articulation and resonance were balanced, the type was the predominant respiratory medium (65%), whereas the breathing mode mixed (45%), the coordination between breathing in 90%, the maximum phonation time increased by 65% and the coefficient s / z was adequate in 65%. **Conclusion:** the aspects of vocal health was observed a high rate of allergy, care of his own voice most choristers do not know how the voice is produced and auditory perception was found in a large number of choristers hoarse breathy vocal quality and maximum phonation time increased.

KEYWORDS: Voice; Phonation; Voice Quality; Music

■ INTRODUCTION

Singing is a fun and healthy activity that is capable of positively influencing the individual's emotional state and immune competence, and has been used as a therapeutic resource in the search of physical and mental health¹. In addition to these benefits, group singing is also a space that provides musical learning, vocal development, and social integration and inclusion, since it encourages the establishment of relationships that value understanding and respect of others, promoting the

expression of subjectivities in the comfort offered by the force of the group².

Most choirs are composed by amateur singers, usually affiliated to schools, religious groups, communities or other organizations. They commonly share a wish to belong, of being part of a greater context and a sincere love for singing and music³. Especially for children, singing in a group represents a field of discoveries^{4,5}. Choir activity stimulates the development of their sensitivity as well as specific skills, in addition to providing essential knowledge for vocal health maintenance⁴. Thus, investigating the music of children is to respect their right to live music and its intense dynamics⁶.

Choir singing in children and adolescents may become a challenge in the phase of voice mutation, since the boy's childish voice acquires a masculine characteristics and there may be lack of harmony in its development⁷, difficulties in muscle adaptation

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of the vocal folds, auditory consciousness of the change and self-consciousness of the body's transformations⁸, thus presenting phases of vocal instability^{9,10}, becoming slightly hoarse and unstable with several fluctuations^{11,12}.

Therefore, caring of vocal health is of crucial importance, since dealing with a type of voice that is vulnerable to several disorders becomes complex and dangerous for the music educator because if he is not apt for this task, there may be damage to the voice of adolescents¹³.

Another aspect that may interfere in vocal quality is the high occurrence of allergies¹⁴, since any airway disorder may harm voice production as the free passage of air is vital to vocal production¹⁵. Furthermore, singing has a high vocal demand, where neuromuscular adjustments of the vocal tract are needed to obtain a great diversity of sound effects; therefore singing practice requires vocal care¹⁶.

Thus, knowing the aspects related to voice is essential in order to work with choirs. Lack of knowledge may cause excessive and inadequate voice use, with consequent problems of vocal friction, reduction of vocal capacities and strain in the entire mechanism of phonation¹⁷. This is the reason why actions by a Speech-Language Pathologist is essential in the control of vocal misuse and abuse in both spoken and singing voices, as the Speech-Language Pathologist, in partnership with the vocal instructor, has subsidies to study and analyze the best techniques for choir singers: respiratory support, coordination between breath and speech, speech articulation, tuning, among other behaviors¹⁸⁻²⁰.

In this context, the evaluation of child and adolescent choir singers provides systematized data about vocal problems, the potentials and limitations that may influence vocal quality, aimed at a good performance and development of the singer²⁰. Currently, it has been made clear that voice professionals depend on specific vocal training that is directed towards their demand, even more specifically in the case of singers²¹. The Speech-Language Pathologist may act in choirs, aiming to improve singers' performances and favoring good and effortless vocal emissions. This job, performed by Speech-Language Pathologists alongside vocal instructors is crucial in order to increase the group's capacities and to assure a better sound and artistic result¹⁸. Therefore, the purpose of this study was to characterize the aspects regarding vocal health, choir singers' knowledge about caring for their own voices, and to conduct an auditory perceptive analysis of the spoken voice, in a child and adolescent choir.

■ METHODS

The project was approved by the Research Ethics Committee of the São Camilo University Center, under number 037/06, being a prospective and descriptive study.

The study was conducted with a choir for children and adolescents, from a permanent group of a Music Education Project of a State University of São Paulo. The subjects were 20 individuals, 14 females and six males, aged between 10 and 18 years, of a homogenous social and economic situation. This choir's repertoire is varied, and composed, in general, by popular songs. The inclusion criteria were: having been a member of the choir for a minimum of three years, and participating in all stages of data collection, including having a Free Consent Term correctly completed and signed by the respective parents or caregivers. The exclusion criteria were absences during data collection and incomplete or incorrect completion of the protocols used in the study.

Data collection was based on three procedures: one questionnaire to be completed by parents, another specific questionnaire for the choir singers, and the conduction of a vocal screening. The questionnaire for the parents was composed of seven objective questions, related to general health aspects of their children, asking about the occurrence of respiratory problems and allergies, hoarseness, hearing difficulties, medical or Speech-Language Pathology assessments or treatments, and information about meals before singing practice. The sheets were handed out to the singers to take home and had to be returned the following week, completed by their parents or caregivers. The second questionnaire was composed by six objective questions that admitted positive or negative answers, directed to the singers, related to knowledge about voice production, musical perception, practicing vocal warm up and vocal cool down before and after singing, as well as voice and health habits, such as undergoing vocal rest and caring for their voices. The questionnaire was completed individually, orally, and registered on the scene by the evaluator. The data collected from both questionnaires were compiled descriptively and are shown in Table 1.

The voice evaluation protocol that was used for vocal screening was developed and recommended by the Voice Committee of the Brazilian Society of Speech-Language Pathology, and contains the following parameters: voice quality (hoarseness, breathiness, roughness, tremor, tension), pitch (low, medium or high), resonance (balanced, hypernasal, hyponasal or low), articulation (adequate, closed,

over-enunciation, phonemic disorder), respiratory type (superior, medium or inferior), respiratory mode (oral, nasal, mixed), coordination between speech and breath and maximum phonation time (adequate, above expected or below expected). The parameter used to classify the maximum phonation time was literature¹¹ that admits that, for children up to puberty, the values of maximum phonation times follow their respective ages, in seconds. The assessment was conducted individually, through the reading of a musical piece of the choir's repertoire and recorded in MP3 format. The vocal screening protocol was completed on the scene by two Speech-Language Pathology judges with experience in the field of voice, at the same time as each individual read the text. Each assessment was recorded for verification and consensus among the judges.

Recordings were conducted individually, in a closed and silent environment, where only the evaluators and the assessed individual were present. The

data obtained from the screening are distributed along Tables 2, 3 and 4.

■ RESULTS

It was verified in the questionnaire directed to the parents that 40% of the choir singers had allergies. The most commonly mentioned substances were: dust, animal hairs, temperature changes, perfume, insect bites, food and drug allergies; 25% reported respiratory diseases and 10% complained of hearing difficulties; 40% hoarseness; 55% referred having had previous otorhinolaryngological evaluations, 20% had previous tonsil and adenoids surgery and 15% underwent Speech-Language Pathology therapy (Table 1).

In regard to the answered questionnaire, 35% of the subjects reported having knowledge about voice production. When asked about musical perception, 55% referred having knowledge about note pitches (Table 1).

Table 1 – Distribution of individuals in absolute (N) and relative (%) values, according to health issues, frequency of hoarseness occurrence reported by the parents of choir singers, different clinical interventions related to voice aspects, knowledge about voice production and musical perception, vocal warm up and cool down, voice rest, voice care measures and the presence of voice complaints

	INDIVIDUALS					
	YES		NO		TOTAL	
	N	%	N	%	N	%
HEALTH ISSUES	05	25	15	75	20	100
Respiratory Problems	05	25	15	75	20	100
Allergies in general	08	40	12	60	20	100
Hearing Difficulties	02	10	18	90	20	100
HOARSENESS	08	40	12	60	20	100
CLINICAL INTERVENTIONS	03	15	17	85	20	100
Otorhinolaryngologic Evaluation	11	55	09	45	20	100
Speech Therapy	03	15	17	85	20	100
Head and Neck Surgery	04	20	16	80	20	100
KNOWLEDGE						
Voice production	07	35	13	65	20	100
Musical perception	11	55	09	45	20	100
VOCAL PROCEDURES						
Warm up	20	100	---	---	20	100
Cool down	03	15	17	85	20	100
Rest	14	70	06	30	20	100
VOICE CARE MEASURES	04	20	16	80	20	100
VOICE COMPLAINTS	07	35	13	65	20	100

As far as the choir singers' vocal behavior, 100% of the investigated sample said they did vocal warm up and only 15% vocal cool down; 70% underwent vocal rest after rehearsal and 20% reported caring for their voices, taking measures such as: not consuming iced fluids, not screaming, performing vocal warm up exercises, not eating chocolate before singing, eating apples and drinking water.

As far as the presence of voice complaints, 35% of the choir singers said they had voice complaints, though most (65%) did not have this complaint (Table 1).

The perceptive auditory analysis revealed slight hoarseness in 25% of the subjects, 35% breathiness and 5% of slight roughness. Among the parameters observed in a moderate degree, only 10% of the sample were classified with hoarseness. Parameters of tremor and tension were not verified, to any extent, among the singers (Table 2).

The results referring to the parameters pitch, resonance, articulation, respiratory type and mode and coordination between speech and breathing are shown in Table 3.

In the evaluation of pitch, most choir singers had high pitch in 55% of the cases, followed by 30% medium pitch and 15% of the voices that were low-pitched.

When analyzing resonance, it was verified that 75% of the sample were considered balanced, 20%

hyponasal, 5% low and there were no cases of hypernasality.

As far as articulation, 95% were adequate, 5% were closed. No observed voices were considered over-enunciated or with phonemic disorders.

The respiratory type was predominantly medium with 65%, followed by 30% superior and 5% inferior. As far as the respiratory mode, 45% of the subjects were considered mixed, 35% nasal and 20% oral.

Coordination between speech and breathing was present in 90% of the choir singers and absent in 10%.

The study of the maximum phonation time revealed that 60% of the choir singers had increased phonation times for phones [a] and [i]; 25% of the individuals had adequate times and 15% were below expected. When observing the phone [u], 65% of the choir singers had increased values, 20% were adequate and 15% below expected. For the phone [s], 75% of the subjects had values above expected, while 20% were within the expected time and 5% had reduced times. The [z] phone had increased times in 70% was adequate in 25% and was below expected in 5% (Table 4).

The s/z ratio was adequate in 80% of the choir singers and altered in the remaining 20% (Table 5).

Table 2 – Distribution of the number of choir singers, in absolute (N) and relative (%) values, according to the grade of the different voice quality aspects

Grade	Hoarseness		Breathiness		Roughness		Tremor		Tension	
	N	%	N	%	N	%	N	%	N	%
Absent	13	65	13	65	19	95	20	100	20	100
Mild	05	25	07	35	01	05	---	---	---	---
Moderate	02	10	---	---	---	---	---	---	---	---
Intense	---	---	---	---	---	---	---	---	---	---
TOTAL	20	100	20	100	20	100	20	100	20	100

Table 3 – Distribution of the number of choir singers, in absolute (N) and relative (%) values, according to pitch, resonance, enunciation, respiratory type and mode and coordination between speech and breathing

	INDIVIDUALS	
	N	%
PITCH		
Low	03	15
Medium	06	30
High	11	55
RESONANCE		
Balanced	15	75
Hyponasal	04	20
Low	01	05
Hypernasal	---	---
ENUNCIATION		
Adequate	19	95
Closed	01	05
Over-articulated	---	---
With phonemic disorder	---	---
RESPIRATORY TYPE		
Superior	06	30
Medium	13	65
Inferior	01	05
RESPIRATORY MODE		
Mixed	9	45
Nasal	07	35
Oral	04	20
COORDINATION BETWEEN BREATH AND SPEECH		
Present	18	90
Absent	02	10
TOTAL	20	100

Table 4 – Distribution of individuals, in absolute (N) and relative (%) values, according to sustained maximum phonation time for the phonemes /a/, /i/, /u/, /s/ and /z/

PHONEMES	MAXIMUM PHONATION TIME						TOTAL	
	ABOVE		ADEQUATE		BELOW			
	N	%	N	%	N	%	N	%
/a/	12	60	05	25	03	15	20	100
/i/	12	60	05	25	03	15	20	100
/u/	13	65	04	20	03	15	20	100
/s/	15	75	04	20	01	05	20	100
/z/	14	70	05	25	01	05	20	100

Table 5 – Distribution of choir singers, in absolute (N) and relative (%) values, according to the relationship between glottic source and friction source (s/z ratio)

S/Z RATIO	INDIVIDUALS	
	N	%
Above 1.2 altered	02	10
Between 0.8 and 1.2 adequate	16	80
Below 0.8 altered	02	10
TOTAL	20	100

■ DISCUSSION

The presence of allergies was the health factor most commonly reported by the choir singers' parents or caregivers and most of them reported as aggressor agents substances that usually cause respiratory allergies (dust, animal hair, perfume, temperature changes). This occurrence may interfere in choir activity, since this disease harms breathing and, consequently, singing. Singing demands an adequate coordination between phonating and the respiratory system, and the skill in regulating expiration favors the singer's competence to sustain a given note²². Furthermore, it is important to note that respiratory allergies and upper airway infections cause the voice to be used in inadequate conditions, that is, in the presence of dried mucosa, edema and irritation of the vocal tract¹⁹. Thus, for some authors^{23,24}, these affections may represent a risk factor that contributes to the occurrence of voice disorders, especially for those who have intense vocal use. In the presence of respiratory allergies, the mucus becomes denser, interfering in the mucous wave of the vocal folds which may result in edemas and in vocal abuse, since there is an increase in the need to cough or clear one's throat²⁴.

Given these conditions, it is believed that the hoarseness reported by the parents in this study may be associated to the presence of vocal abuse and constant colds, resultant of infections of the upper airways. Hoarseness is a classic symptom of a disorder in voice production that may cause alterations ranging from a slight edema to important mass disorders of the vocal folds²⁰. Disorders in the structure or the functioning of the vocal tract may result in inadequate emissions with the presence of hoarseness and roughness²¹. Specifically for this sample, the phase of voice mutation should also be considered as a cause of the hoarseness perceived by the parents. During this period, that may range from the age of 12 through 15, there are several changes in vocal pattern, such as instability, and variations in intensity, fundamental frequency and vocal register^{25,26}. Likewise, the choir singers in this study referred voice complaints that may also be associated to the discomfort experienced during this phase. During voice mutation, the boy's childlike voice acquires male characteristics, and there might be a lack of harmony in development⁷. According to some authors, transformations in some structural lesions of the vocal folds such as cysts and nodules may occur, and regressions in the lesions and consequent diminishment of the voice complain are likely after puberty²⁷. In the case of child and adolescent singers, it is important to know the clinical history,

follow the vocal development and behavior of these individuals and to provide guidance for singers and their parents concerning these momentary changes that result from the anatomic and physiological development of the larynx, in order to guarantee that these lesions do not evolve after the voice mutation period.

Thus, the work of the otorhinolaryngologist doctor and of the Speech-Language Pathologist in the follow-up and guidance of these choir singers is extremely important. According to the present study, half of the individuals has undergone at least one evaluation with the otorhinolaryngologist for vocal follow-up and 20% of the individuals have already been through surgery to remove tonsils or adenoids. About this issue, it is known that the hypertrophy of tonsils and the presence of adenoid vegetation may especially interfere in these children's breathing, which may not only harm their vocal production, but also cause disorders in their stomatognathic system²⁸ and even interfere in these individuals' learning processes²⁹.

The knowledge of the aspects related to voice is essential when working with a choir. In the present study, 65% of the individuals reported not knowing how the voice is produced and, consequently, did not know all the factors that contribute to a good vocal health, a fact that is in accordance with the literature that was researched³. On the other hand, it was found that all choir singers performed vocal warm up exercises. In adopting this practice, they are in agreement with literature findings on the importance of this procedure before rehearsals and concerts as a functional, prophylactic measure that will contribute to the maintenance of a good singing voice¹⁸. However, the minority of the subjects in this study reported performing vocal cool down exercises after rehearsal, an important procedure in returning the voice to adequate patterns for use in colloquial conversation. In spite of this, 70% of the subjects reported seeking vocal rest after rehearsal, remaining silent for a few instants, in order to rest their voices.

According to the study, 80% of the individuals reported vocal abuse that may cause serious harm to their general and vocal health. These attitudes may lead to excessive and inadequate voice use, with consequent problems of vocal friction, reduction of vocal capacities and wear of the vocal mechanism¹⁷. Faced with this condition and considering that the Speech-Language Pathology practice should be considered a Health Education process, this professional should not be limited to verifying and controlling abuse, but must broaden the horizons, developing with the singer strategies that will favor a change in attitude regarding his vocal behaviors¹⁸.

This is the only way through which his intervention will be able to provide positive changes to the voices of these singers.

When analyzing pitch in the vocal screening, it was observed that the children and adolescent choir is composed of predominantly high pitched voices, probably due to more members being girls and/or boys who have still not undergone vocal mutation. This finding is in agreement with literature that states that high pitch is common during childhood¹².

The parameter of vocal quality revealed hoarse, breathy and rough voices that may be associated to voice mutation and to the lack of vocal care. During this period, the voice becomes slightly hoarse and unstable, with several fluctuations¹¹, and during adolescence vocal strain is seen more frequently¹².

The importance of the resonance system on the voice should also be noted, highlighting the fact that a good resonance provides intensity and beauty to the harmonics of laryngeal sounds. The richer in harmonics, the best resonance the voice will have, and thus more sounding and intense³⁰. The resonance of the choir singers was balanced and was thus considered when there was harmonic use of all resonance cavities¹¹.

In regard to enunciation, the choir singers generally had adequate parameters, when considering good enunciation the production of well-defined sounds, with effective participation of the organs of articulation¹¹.

The predominant respiratory type was medium, considered thus when there was little superior or inferior movement during inspiration and anterior movement of the medium chest region. The respiratory type was classified as *superior* when there was expansion of only the upper part of the chest cave with visible shoulder elevation; and *inferior*, upon absence of movement of the superior region and expansion of the inferior region¹¹. It is known that the respiratory type that brings most benefits to singing is diaphragmatic abdominal breathing, as it favors an increase in subglottic pressure without causing laryngeal overcharge¹⁸.

The prevalent respiratory mode was mixed, classified as such when the individual breathed through the mouth at one time and through the nose at another¹¹. The respiratory mode was classified as oral when the individual breathed through the mouth, being unable to breathe through his nose, and as *nasal* when the individual breathed through the nostrils, remaining with their lips closed during rest.

Coordination between speech and breathing was present in most choir singers, and was considered so when there was harmonic coordination between breathing, phonation and enunciation; and was considered *absent* when the individual's coordination was not harmonic¹¹.

Most subjects had an increased maximum phonation time, probably due to weekly choir practice involving constant exercises in respiration and air escape coordination that favor respiratory capacity and the increase in these times. The s/z ration was considered adequate when its values lay between 0.8 and 1.2 and, if they were below or above these values, it was considered altered¹¹.

The importance of the Speech-Language Pathologist working with the aspects related to respiration in choirs should be noted when analyzing the results of this study. Breathing is crucial for every singer, especially for the amateur choir singer who usually has no previous singing knowledge, and that developing consciousness about breathing may contribute to the process of the choir's musical learning². Studies show that breathing is one of the parameters that best improve with Speech-Language Pathology interventions with singers¹⁸. Therefore, it becomes extremely important to provide the individual with guidance about these concepts, in the search for better sound results of each member and of the entire choir group.

■ CONCLUSION

Based on the findings of this study, it may be concluded that:

- The health aspect of choir singers most frequently observed by parents is the presence of allergies;
- In spite of having 3 years of experience in choir practice, a significant number of individuals does not know about vocal production and does not care for their voices;
- All participants reported the performance of vocal warm up exercises, while a small part of them referred that they performed vocal cool down exercises;
- Most choir singers did not have voice complaints;
- A small number of members had hoarse and breathy voices;
- Most had increased maximum phonation times;
- The other parameters such as: breathing, pitch, enunciation, resonance and s/z ration were within normal parameters that were expected for this population.

RESUMO

Objetivo: caracterizar os aspectos de saúde vocal, o conhecimento dos coristas quanto aos cuidados com a própria voz, e realizar uma análise percepto auditiva da voz falada, em um coro infantil juvenil.

Métodos: participaram deste estudo 20 indivíduos, de ambos os gêneros, entre 10 e 18 anos, integrantes de um coro. Foram aplicados dois questionários: um voltado aos pais sobre a saúde geral, tratamento médico e hábitos alimentares de seus filhos e outro para os coristas, que abordou aspectos sobre vivência no canto, conhecimentos sobre a voz, hábitos e saúde vocal. Foi realizada uma triagem vocal individual para análise perceptoauditiva da voz falada por meio de protocolo específico.

Resultados: no questionário aplicado aos pais, foi observado que 40% dos coristas apresentaram algum tipo de alergia. Quanto ao questionário respondido pelos coristas, 65% não souberam dizer como a voz é produzida; 100% realizavam aquecimento vocal; 80% não possuíam cuidados com a voz; 35% apresentaram queixa vocal. Na triagem vocal, verificou-se 35% de coristas com voz rouca e soprosa e 5% áspera; o *pitch* predominantemente agudo (55%); a articulação e a ressonância equilibradas; o tipo respiratório predominante foi o médio (65%); o modo respiratório misto (45%); a coordenação pneumofonoarticulatória presente em 90%; o tempo máximo fonatório aumentado em 65%; e o coeficiente s/z mostrou-se adequado em 65%. **Conclusão:** nos aspectos de saúde vocal, foi observado um alto índice de alergia; nos cuidados com a própria voz, a maioria dos coristas não sabe como a voz é produzida; na análise perceptoauditiva, foram encontrados em um grande número de coristas, qualidade vocal roucosoprosa e tempo máximo fonatório aumentado.

DESCRITORES: Voz; Fonação; Qualidade da Voz; Música

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