

CHANGES OF THE VOCAL QUALITY OF TEACHERS IN RELATION TO THEIR PROFESSIONAL PREPARATION (AS MEASURED BY THE DYSPHONIA SEVERITY INDEX)

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Abstract: *The author's research is based on the preceding stages of her work concentrated on changes of the vocal quality measured by means of the standard DSI (Dysphonia Severity Index) method. The research investigates to what degree the basic vocal characteristics of primary school teachers (who are at the same time part-time students) are influenced by their professional preparation (ie musical theory and practice) and by the real conditions of their school practice. The previous research is summarized and results are formulated as criteria for the future intensive work with a group of students in the final stage of the research project.*

Keywords: *voice, teachers, voice hygiene, voice evaluation, Dysphonia Severity Index.*

Introduction

Voice is one of the basic working tools of every pedagogue and any changes of its quality can considerably facilitate or complicate their work, sometimes so much that the impaired efficiency of work can finally even lower their pedagogical success.

Both my long-term experience of working with clients facing serious voice problems or even disorders (mostly teachers and other pedagogical workers) and professional studies confirm that the field of voice problems especially needs prevention.¹

The aim of my project, focused on teachers' voices and their characteristics in the conditions of their professional activities, is a conception of exercises that would improve the vocal condition, prevent or remove the consequences of professional load (or often overload) and tackle voice problems which might grow into disorders requiring

¹ The results of Czech and foreign experts' studies have been referred to in my previous papers dealing with the gradual stages of my research. See FROSTOVÁ, J. 2009, pp. 135-147.

re-education or even therapy. The professional load is joined by negative impacts of an unhealthy life style. The somatic characteristics of the vocal cords (and the organs of speech generally) are greatly affected by smoking, other physical, climatic and biochemical influences and last but not least bad eating habits (or their consequences, eg *gastroesophageal reflux*). The voice apparatus is damaged by alcohol, cold drinks consumed at an unsuitable time etc. The quality of voice and its condition at a particular time is also significantly influenced by various stressors, although their connection need not be immediately obvious (eg confrontational relations at home or at the workplace).

My previous research as well has shown the teaching respondents' feeling that it would be highly useful for them to get acquainted (more thoroughly and in an acceptable form) with certain exercises and the principles of vocal hygiene which would help them to cope with the voice load that is logically brought by pedagogical communication.

My work on the methodical text for teachers is based on the research I have long been realizing thanks to my participation in the research project *School and health for the 21st century*.

In the previous stages of my research I applied a questionnaire directed towards finding out the social and professional factors that influence negatively (or positively) the quality of teachers' voices. At the same time I also used the VHI (Voice Handicap Index) questionnaire, where each respondent assessed subjectively his/her voice quality and its impact on the socioprofessional functions – the results have already been published.

In order to monitor the differences in the teachers' vocal quality during their socioprofessional preparation² I decided to use the DSI method³ as an objective technique. During the recording of voices for the computer analysis by means of the DSI method, other audio and video recordings were made which helped to illustrate the situations relevant to the respondents' vocal condition and vocal quality measured and analysed. All the recordings were made in strictly identical standard conditions for all the respondents and had the following phases: adaptation and motivation, pre-performance, performance, diagnosis.⁴

The research objective

The present stage of research follows the previous investigation the results of which were published in 2008.

Voice recordings of the first and the second series (n=113) have been finished.

The procedure of the investigation:

1. Voice recordings were made (the 2nd measurement of 47 tested persons, the 1st and the 2nd measurements of 66 TPs).
2. The results were processed by the DSI method.
3. The supplementary recordings (observing TPs while their voices were recorded) were analysed qualitatively.

² namely 113 practising teachers simultaneously studying the Faculty of Education.

³ WUYTS, F. L.; DE BODT, M.; MOLENBERGHS, G. et al. The Dysphonia Severity Index: An Objective measure of Vocal Quality Based on a Multiparameter Approach. In *Journal of Speech, Language and Hearing Research*, Vol. 43, 2000, pp. 796–809.

⁴ Cf FROSTOVÁ, J. 2009, pp. 135–147.

4. The recommendations, notes, inquiries, proposals etc that the tested persons expressed during the recording were processed.

The methodical procedure and the initial assumptions

All the tested persons' voices were recorded for the electronic analysis which evaluated the following data for each TP: the maximum phonation time (MPT), the highest frequency (F0-High), the lowest intensity (I-Low), jitter, and the final dysphonia severity index (DSI).

Each tested person's voice recording of MPT, F0-High and I-Low was done three times (after a detailed instruction) and only the recording with the TP's best results was used for analysis.

The maximum phonation time was measured in seconds. Three tests were realized after the examiner's instruction and demonstration⁵. Only the recording with the best result was analysed later. The TP phonated the „a“ vowel for a long time and in his/her usual pitch and intensity to reach as natural and free phonation as possible. The TP was standing during the measurement and was instructed to take a really deep breath and to phonate „a“ as long as possible until the breath supply is exhausted. The TP was in eye contact with the examiner during the voice performance. If any defects appeared, like an insufficiently deep breath, the end of the phonation before the air supply was exhausted, an unusual pitch of the voice, or too strong or too weak dynamics, the test was repeated.⁶

The DSI value was then calculated according to the formula made of the measured values of the highest frequency, the lowest loudness and the maximum duration of phonation and jitter.

I assumed that besides the negative and positive consequences of school practice the tested teachers' vocal quality would be affected by the fact that for some time they had been exposed to the demands of musical theory and practice. The students (practising teachers) were guided to regular voice training during the interval between the first and the second series of their voice recordings. They were asked to study the compulsory literature for singers and to do some selected breathing exercises, phonation and resonance exercises and singing-voice exercises. Their attention was drawn to recommendations concerning voice hygiene. The respondents obtained theoretical information on the basic disorders and defects of voice and on the possibility to tackle their own possible voice problems at the specialized departments of ENT or phoniatics.

My previous investigation already showed that study had positive consequences: the extent of the knowledge of voice hygiene increased, the concentration on voice training was more decided etc. The attitude to one's voice changed as well. The TPs got much more interested in the problems of voice and began to observe its parameters more maturely. The previous rather accidental attention devoted to voice, as well as the rather intuitive interpretation of perceived difficulties, were replaced by a more erudite view.

⁵ Some authors state that if the examiner's instruction contained a practical demonstration as well, the MPT recording was affected positively. My experience has shown me that verbal instruction is not sufficient during the other recordings either. Cf. Neiman, S.G. – Edeson B. 1996, p. 286.

⁶ Cf De BODT, M. et al. 1996, p. 326.

Recommendations concerning voice hygiene began to be appreciated more properly. As to the school practice: in the field of voice condition, more attention was paid to the senior colleagues' experience and its utilization.

These findings, following from conversations with the TPs before and during the second series of recordings, led me to the assumption that the given facts might result in some improvement of vocal quality and hence also of the DSI values.

The tested set

The set was (after the exclusion of persons with incomplete data) made up of 5 men and 108 women, all of them teachers and part-time students trained for the first stage of the primary school (the pupils aged 6–11 years).

Results

The comparison of the first and the following measurement results shows a slight positive shift. With the increase of the number of measurements this shift became a bit more obvious: in the set of 47 tested persons some improvement of the DSI was evident in 66%, while in the bigger set (n=113) the improvement showed in 80 %.

On the other hand, the average value of the positive shift of the DSI did not practically change (the 1st measurement being 1.49, the 2nd 1.37). The very small increase of the positive shift can be accounted for by the fact that my set of TPs was an accidental choice of part-time students, while most works using the DSI method concentrate on clients of phoniatic facilities, ie people seeking help in the field of voice disorders and diseases, so that their 'input' vocal quality was different from that of my respondents.

It should be added that 22.1 % of the TPs showed „*a negative shift*“, but all of them were vocally indisposed during the second series of measurements.⁷ Only about one third of them had a real deterioration of their vocal quality mostly because of a relatively long-term working load (eg a sequence of their duties at open-air schools, a long-term stress at home or at work).

The following chart shows the spread of the shifts (with intervals usually given for the DSI):

⁷ These persons were not excluded from the measurements due to the fact that '*the negative shift*' in their DSI values was hardly significant; the chart expresses rather the number of TPs with momentary problems than a real negative shift in the DSI values.

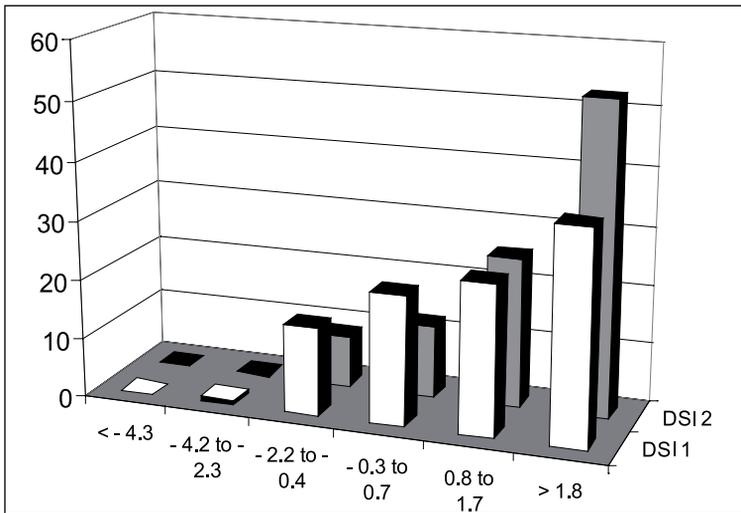


CHART 1. The comparison of the 1st and the 2nd DSI measurements (n=113)

Needless to say that I am aware of the fact that the present research has not sufficiently answered the question of what real influences cause the positive shift and in what proportions. This problem will be tackled in the following phase of my investigation, where a smaller number of teachers will be tested, which may facilitate a more detailed and differentiated account of the *causes* and *consequences* (see below).

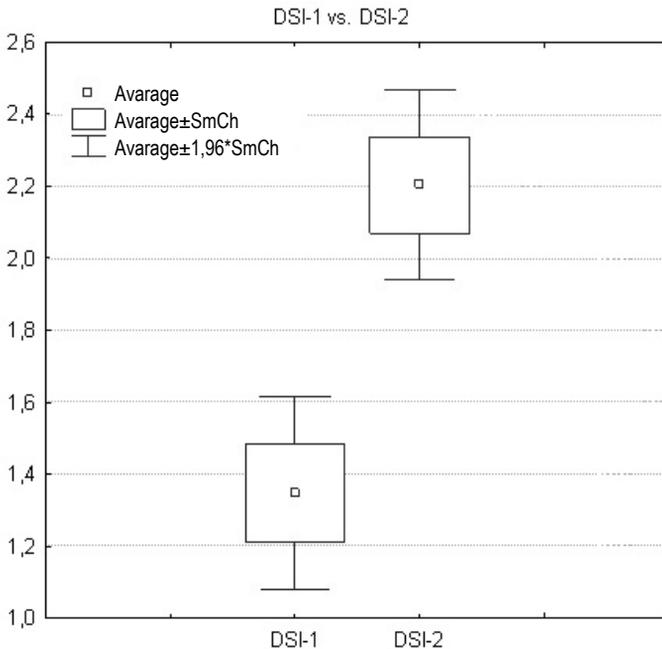


CHART 2. The comparison of the 1st and the 2nd DSI measurements (n=113) (T-test)

The comparison of the DSI-1 averages with the DSI-2 averages in CHART 2 shows an acceptable, but (in comparison with the DSI changes as a consequence of therapy in clinical patients)⁸ rather dispersed values around the median, which suggests that my group of TPs was, from the point of view of individual vocal characteristics, not very homogeneous.

Changes in the duration of phonation (maximum phonation time, MPT)

During a year's interval the MPT was, admittedly, prolonged in 70 % of the tested persons, but in most shifts the MPT was prolonged by 1 to 5 minutes (see a more detailed spread in CHART 4). Mere observation informed me that these results were affected by a wrong technique of breathing and that mastering the correct work with breath would shift the MPT values more decidedly.

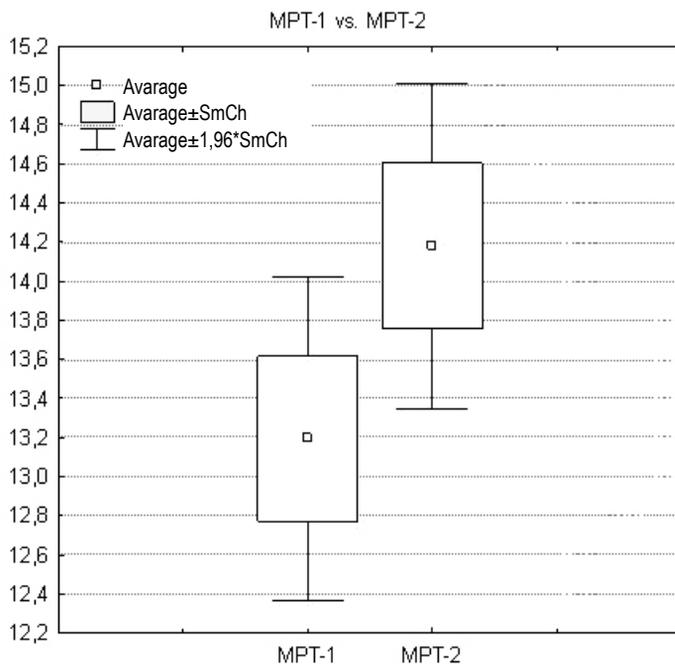


CHART 3. Changes of the MPT in the 1st and the 2nd measurements (n=113) (T-test)

⁸ Cf GONNERMANN, U. – NAWKA, T. 2004, pp. 19-26.

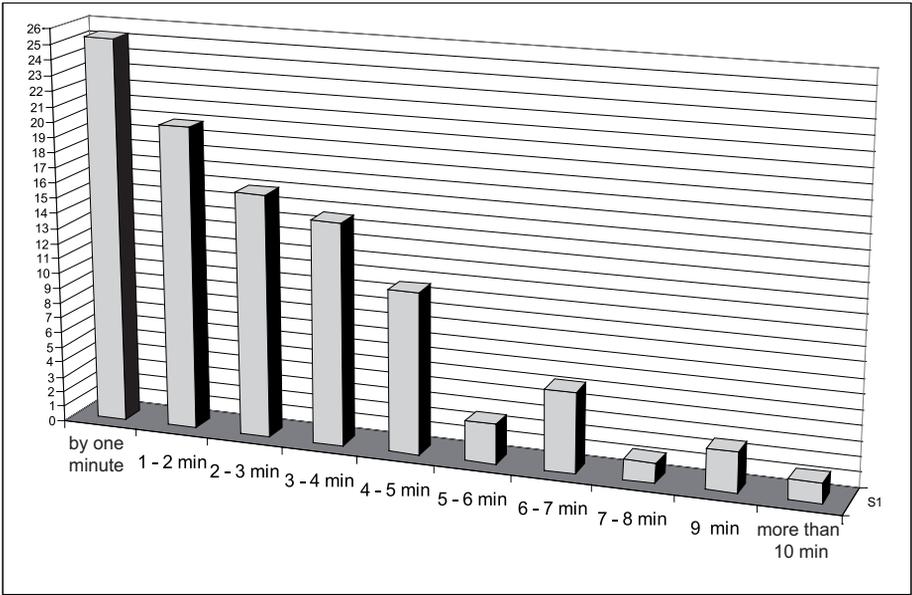


CHART 4. The duration of phonation

Changes of the vocal range

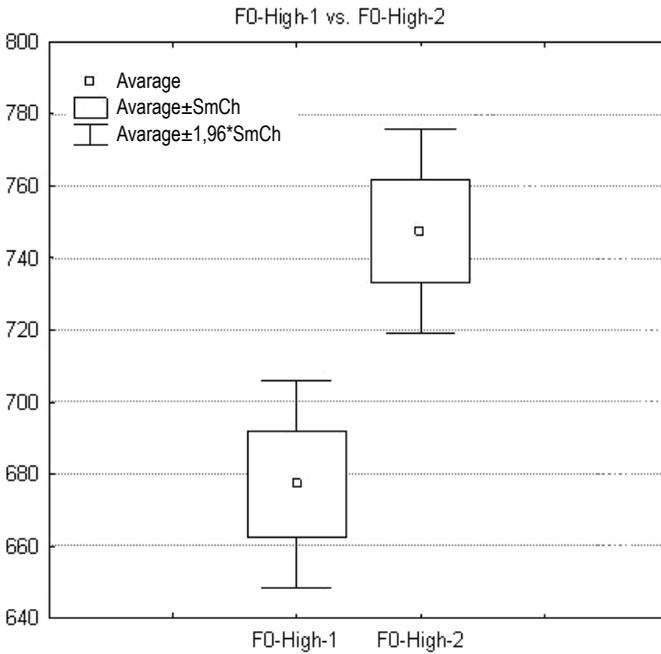


CHART 5. Changes of the vocal range (T-test)

Similarly to the changes of the MPT and other parameters measured for the calculation of the DSI index, all changes (even small ones) of the vocal range should be rather assessed as signals of changes which should be corroborated with a more detailed examination of the respondents

These changes are not as obvious as the changes of the total DSI index. Nevertheless, a little more than a half of all the TPs showed a distinct shift in their vocal ranges. Chart 6 offers a more detailed spread of the changes. In 20% of the TPs the vocal range increased by the major third.

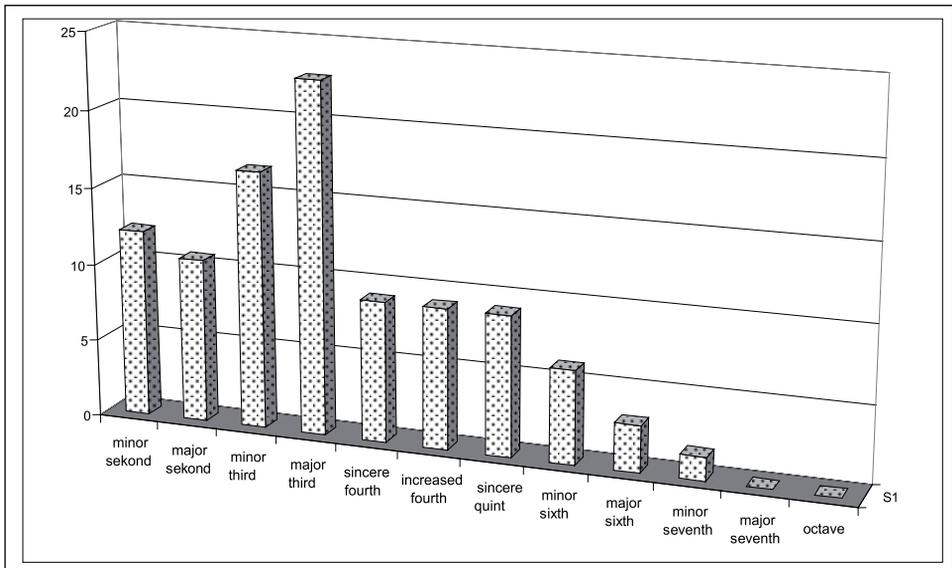


CHART 6. Changes of the vocal range

The respondents' suggestions and notes

Valuable information was obtained from the TPs' notes and observations presented and registered during the tests (recordings) and in the introductory questionnaires. They were used as illustrations of the data that had been found out, and covered the following fields:

Voice hygiene

The need of information on voice hygiene was expressed in a number of statements, eg: „I want to know everything about the care of voice“, „I know nothin“ or „I think I lack any information about the care of voice and therefore I don't even know what I'd like to learn“. Many answers show a sense of responsibility for the maintenance of voice as a working tool, as well as a fear of the future: „I'd like to learn how to take care of my voice, how to save it so as not to have any problems with it in the years coming (with regard to the fact that voice in fact earns my living)“,

„how to look after my voice in the future, regarding its big load in the teaching profession“ etc.

Voice indispositions in voice professionals are not at all exceptional: *„I caught a flu, in about a week’s time I became hoarse and finally completely stopped talking. During my treatment I tried to observe rest of voice. Talking made me very tired. After a month my voice was still hoarse, but I was forced to talk. My voice condition was not getting worse, but for a long time it did not improve either. At the chemist’s they recommended me some mints to suck.“*

„I’d like to learn something about the disorders of the vocal cords and the ways of taking a better care of a tired voice. My voice is now tired sooner and more often than before, I feel that my vocal cords are tight and my throat sore.“

„I’d like to know how to take care of my voice when I have a cold – so that the treatment is as quick as possible and my voice can be used properly again.“

Inconsistent solutions and neglecting voice problems

Many TPs perceive and register their voice problems (also because of the feedback from the people around them), but postpone any solution and underestimate the consequences. *„My husband constantly urges me to clear my throat. It annoys me when my voice changes in the middle of the sentence. I feel as if I swallowed dust. Clearing my throat is not sufficient. I have to have a drink and wait a while to continue my talking. It’s unpleasant. My hoarse is worse and worse.“*

„My voice is lately getting tired more quickly than before. I am beginning to talk in a hoarse voice and to lose a higher pitch.“

„I usually have a slight hoarse in the morning; I feel that during my teaching practice my voice has got „darker“.“

„I’m thinking about seeing a phoniatician; my voice is often gone (I’ve had my tonsils taken out). It happened to me that I felt as if my vocal cords had tightened and then the pain passed to my ear and tongue (tingling). Therefore I’d like to learn how to save my voice, how to work with it more economically.“

„I’ve lately been feeling a sore throat (clearing it by coughing); the cough brings me relief. I see the cause in my overloading and straining my vocal cords.“

„In 2005 I underwent an operation for a vocal node. My voice improved, but some problems still continue. The cause of their origin: my unfamiliarity with voice work in the teaching profession.“

Breathing

It follows from my own observation and from other authors’ findings that most teachers talk using the unsuitable upper, shallow type of breathing. Nevertheless, the respondents perceived the lack of breath and similar problems more often while singing (eg: *„I’d like to improve my breathing when I sing, I’m short of breath, I cannot keep the phrases“*, *„I’d like to improve my breathing technique“*) than speaking (*„I’d like to improve my breathing to keep my breath till the end of the sentence“*).

The range of the singing voice and the pitch of the speaking voice

Teachers feel negative changes in the range of their singing voices and the pitch of their speaking voices: „*I'd like to have a higher pitch of my voice, it has become gruff and its speaking pitch has lowered*“, „*I'm unable to sing as high as before, and I see the cause in minimal training*“, „*since I don't train, my vocal range is diminishing, I'd wish to have more certainty in my voice as well as richness, especially in high tones*“.

„*My speaking voice has got gruff. I suppose that it has changed because I overloaded it at the beginning of my teaching practice as well as in my free time activities. Due to the same reasons the range of my singing voice is smaller now, a „jump“ in my vocal range has appeared.*“

„*I sometimes speak in a high voice. From time to time I get hoarse and have pain in my vocal cords. I shout more often – I'm unable to control my son in peace (when my son does something silly, I yelp at him). My voice has not such a range, clarity and sustainability as it had some time ago.*“

Conclusions

The obtained results suggest that the impact of the professional preparation in the field of musical theory and especially practice (training the singing voice) probably contributes to the required changes of the vocal quality measured by means of the DSI.

The exercises and singing preparation help to improve the voice condition (eg the shift in the MPT is recognizable, tendencies to the improvement of the vocal range are also obvious).

The perception of voice characteristics is cultivated and the attitude to the reflection on the vocal quality is changed positively.

The theory and practice of voice hygiene is more appreciated. The application of the elementary principles of voice care also seems to partly paralyse the negative influences of the teaching practice (overloading of the voice, consequences of teachers' overall strain connected with the teaching profession).

The measurement of the vocal quality by means of the DSI method has proved to be successful for registering differences in the vocal quality in dependence on a certain intervention (therapy, rehabilitation, re-education, teaching etc). It can serve very well as an indicator of changes in some basic parameters influencing the quality of voice (MPT, F0-High, I-Low, Jitter). It can be a very reliable signal of a change (pre- and post-); however, this technique cannot be expected to give exact and differentiated information on the separate voice parameters and the causes of their changes. Moreover, the DSI method requires strict standard conditions for testing – especially a completely silenced room. In teaching practice (if, eg, a teacher is tested at school after his/her classes) it is necessary to take into account that the DSI method will measure the changes fairly reliably, but the measured values cannot be compared consistently with the usual classification of the degree of dysphonia, because the input data will be affected by any imperceptible 'noise', even in a quiet, but non-standard room.

On the basis of the existing investigation it is possible to draft out a project of training directed towards voice care for teachers – voice professionals. The methodical manual will meet the requirements expressed by the tested persons in the questionnaires as well as during the recordings of their voices by means of the DSI method (see above).

The manual will contain condition exercises that can also be used for rehabilitation, condition exercises whose objective is to develop the speaking as well as the singing voice, and comprehensive information concerning directly voice hygiene.

It will then be necessary to draw teachers' attention to the way they work with breath during their teaching. Wrong breathing is the basis of the wrong voice technique and results finally in a lower quality and health of professionals' voices. The condition **breathing exercises** try to create the skill of mixed breathing, thus contributing to the improvement of voice health as well as a change or development of various voice parameters.

Phonation and resonance exercises remove the undesirable strain in the throat and help to induce a feeling of relaxed vocal cords. The exercises teach how to use head resonance more effectively. Head resonance is the basic prerequisite for a freely sounding voice, both speaking and singing.⁹ This will be followed by **staccato exercises** (supporting strong closing of the vocal cords), **combined relaxation exercises** (lowering muscle tension, especially in the regions of the neck spine and the breast spine), **exercises for improving articulation** and **exercises for improving the strength and setting of the voice**.¹⁰

In order to maintain the existing voice condition it is important to know how to work with voice when **the voice disorder has subsided** and what to avoid so that the voice organs cannot be impaired due to ignorance.

Teachers at the 1st stage of the primary school (with pupils aged 6–11) and nursery school teachers have singing as a part of their profession. Most teachers at the 2nd stage of the primary school feel a close relation to singing even if they do not teach music. The manual will therefore offer some exercises supporting the development of the speaking- and the singing-voice techniques. They should be a motivation and an inspiration for further self-education.

ZMĚNY KVALITY HLASU UČITELŮ MĚŘENÉ DSI V KONTEXTU PROFESNÍ PŘÍPRAVY

Abstrakt: Autorka navazuje na předchozí etapy šetření, zaměřeného na zkoumání změn kvality hlasu pomocí standardní metody DSI (Dysphonia Severity Index). Práce sleduje, do jaké míry intervenují způsob profesní přípravy učitele (v rámci hudební teorie a praxe) a aktuální podmínky školské praxe studentů kombinovaného studia ZŠ do základních charakteristik hlasu. Práce syntetizuje předchozí šetření a formuluje zá-

⁹ In my conception the expression „singing voice“ means the voice used for singing. It can either be a trained voice or a voice without any singing technique. Cf NOVÁK, A. 2000, p. 111.

¹⁰ Cf A Rehabilitation System and Recommended Exercises for Teachers with Voice Disorders. (FROSTOVÁ, J. 2007, pp. 417–426).

věry předznamenávající intenzivní práci se skupinou studentů, plánovanou v závěrečné etapě výzkumného záměru.

Klíčová slova: hlas, učitelé, hlasová hygiena, hodnocení hlasu, Dysphonia Severity Index.