ANDREA ASZTALOS

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Juhász Gyula Felsőoktatási Kiadó
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FOREWORD

In the past few years, the author of this book has experienced a growing interest in the theory and practice of singing voice production of children, both in Hungary and abroad. This is the main reason why it has been considered of utmost significance to summarize and share the theoretical basics as well as the practical aspects of the topic which the author has been able to gather throughout more than 20 years of her career as a teacher and also as a researcher into the theme.

This book has been designed and written for the students of music who study at faculties of education, also for the students of lower primary- and kindergarten teacher training programs, but, in general, all teachers of music will find useful information, interesting ideas, recommendations, and easily adaptable practical tasks and exercises in it. This book will also offer something useful to read for all those readers, who share an interest in the topic of children's voice and singing.

The author of this book sincerely hopes that all those who take the book in their hands and read it, including current and would-be music teachers and the general public in summary, all those who are interested in the topic, will find useful information in it. The book has chapters in it concerning the characteristics of children's singing voice and, also a repository of practical advice with tasks aimed to improve children's singing technique.

Dr. Andrea Asztalos PhD
author of the book
assistant professor
singing-music teacher
choral conductor
vocal training teacher

RECOMMENDATION

Dr. Andrea Asztalos, PhD – The author's volume, entitled *The Theory and Practice of Singing Voice Production of Children* – is a comprehensive, elaborately written work. Kindergarten- and lower primary school teachers, as well as music teachers will all find useful information in this volume. In addition to giving a thorough theoretical overview of the topics of sound producing organs and sound generation errors, Andrea Asztalos also provides readers with a series of practical tasks with the aim of developing children's singing technique. These tasks, ranging from correct bodily positions to the ones expressing emotions, have been designed for different age groups and they are all based on and verified by the author's own teaching background. It is especially worth emphasizing that there are 'story- embedded" tasks, designed for kindergarteners and lower primary school children, as well as repetitions, designed to serve the expressions of emotions and moods; at the same time, all these tasks have been designed so as to improve singing techniques. Thus, the originally repetitive tasks function as actual songs, genuine pieces of music, and they help teachers make their lessons more colorful and enjoyable. In addition, these tasks are able to transform the warm-up period of a lesson into a real singing experience and they evoke the feeling of and the responsibility for music-making in children.

The significance of this volume is even further enhanced by the fact. that although the 'transfer' effect of music lessons on the development of a variety of competences has already been proven by pedagogical researchers, according to various surveys 'music lessons' are usually undervalued when ranking the importance of school subjects. We can only hope that this volume will prove useful in changing this undesirable situation.

Dr. Tamás Altorjay, PhD
assistant professor
opera singer of the National Theatre of Szeged

ABOUT THE AUTHOR

Educational background

The author's enthusiastic and undiminished love for singing and music dates back to her kindergarten years, during which her favorite pastimes included singing and listening to her kindergarten teacher, who sang exceptionally beautifully. In her family there were no professional musicians, but each family member was a music lover. Following her teacher's and parents' advice she went to a primary school which was specialized in music and singing. Her excellent primary school teacher, Ms. Eszter Pecz, laid the foundation for her further studies with unique playful methods, which her future teachers could later rely on. At the same time, at the local music school she took piano lessons diligently and enthusiastically. Her studies were then continued at the István Tömörkény Secondary Grammar School and Vocational Art School in a class, specialized in music and singing. At the same time, she attended solfege and music theory lessons given by Piroska Delleyné Halama, a teacher at the Academy of Music.

From 1995 to 1999 Andrea Asztalos pursued higher educational studies in Szeged, at the Gyula Juhász Teacher Training College, majoring in singing, music and choral conducting. From the third year on she also participated in a special training in solfege. In these programs she had excellent professors to learn from, including Dr. Sándor Bárdi, Dr. László Csanádi, Dr. Józsefné Dombi, Dr. Istvánné Erős, Antal Jancsovics, Prof. Dr. Noémi Maczelka, Lajos Monoki, Péter Ordasi and Irén Vass. It was in 1999 that she graduated with excellence as a teacher of music and singing and as a conductor. In 2009 she was awarded a Master's degree as well in teaching music from the University of Szeged, Gyula Juhász Faculty of Education.

Following her university studies Andrea Asztalos pursued postgraduate studies in the area of conducting children's and youth choirs at the Mozarteum University Salzburg,

In 2015 she began her doctoral studies in the area of educational theory in the Doctoral School of Education at Eötvös Loránd University, Faculty of Pedagogy and Psychology. In 2017 she obtained a university leaving certificate, then in 2020 she defended her dissertation and was awarded a summa cum laude PhD degree.

Teaching career

It was during her college years that Andrea Asztalos started a teaching career. She taught solfege and piano at Andante- and Mozart Music Schools and worked as a pianist accompanying school choirs. In 2002 she moved to Budapest to study solo singing; at the same time, she taught singing and music in secondary grammar schools of the capital and lead school choirs and musical groups. The art of singing and teaching singing have increasingly captured her; her mentor in Budapest, Ms. Ilonka Adorján taught her not only the art of singing but everything about voice treatment as well as the secrets of teaching singing. Ms. Adorján explained and demonstrated a variety of methods to Andrea Asztalos, which have proven extremely useful later on in her work as a music and voice teacher. This is why Ms. Ilonka Adorján can be considered as her primary role model; Andrea Asztalos, in her teaching career, has always strived for becoming as versatile, educated, excellent and motivating, like her mentor was. It was Mr. Endre Dékány, a true master in singing, who taught Andrea Asztalos everything about the Italian philosophy of „bel canto". Both teachers played a significant role in teaching Andrea Asztalos to sing, but, in addition, they also laid an emphasis on explaining her how to teach and how to navigate children in the realm of using their natural voice to sing.

In 2006 she began to work as a voice teacher at the Zoltán Kodály Choir School in Budapest, where, from 2012 to 2014 she led the school's chamber choir. During her teaching period at Mozarteum Andrea Asztalos also had the opportunity to work as conductor with the Superar and the Wiener Sängerknaben choirs in Vienna. In February 2018 she began her teaching career at the Art Institute, Department of Music of the University of Szeged, Gyula Juhász Faculty of Education, first, as a university teaching assistant, then, from 2020, as a university lecturer. Her taught subjects include the Methodology of teaching singing and music, Solfege, Music theory, the Theory and practice of the production of children's voice, and Art mediation. She developed the entire curriculum and the teaching material of the courses entitled Theory and practice of the production of children's voice and Music mediation, a specialist training program. She played an important role in introducing a Master-level new program, called Art instructor. She has been regularly preparing her students for music competitions; they have many times been awarded with first prizes in the category of solo singing and chamber choir singing.

In the framework of the ERASMUS teaching mobility programs, she has taught courses in Children's Voice production both in Hungarian and in English at various institutions of higher education abroad, including the Babes Bolyai University in Cluj, Romania in 2018, the PH in Tirol, Austria in 2019 and, as a Makovecz scholar, in Cluj, Romania, in the academic year of 2019/2020.

Research activities

Her research areas include the study and the improvement of children's singing skills and techniques, the identification of voice production errors and the exploration of possibilities for corrections. She has also done research in teaching philosophies of music and voice teachers, the development of music skills in schools and, in addition, some other topics related to choral music and vocal warm-up.

Since 2012 Andrea Asztalos has been excessively publishing in Parlando, a Journal of Music, also in Educatio, the Bulletin of the International Kodály Society, on the pages of International Journal of Research in Choral Singing and in various volumes of music pedagogy, published both in Hungary and abroad.

Andrea Asztalos has been a regular participant at professional conferences in Hungary and abroad. She has delivered papers in English on the topic of children's voice production at the following international conferences abroad: 51st The Voice Foundation Annual Symposium: Care of the Professional Voice (Philadelphia, USA, 2022), 3rd Symposium on Research in Choral Singing (Virtual Symposium, Penn State University, USA, 2022), 50th The Voice Foundation Virtual Symposium: Care of the Professional Voice (Philadelphia, USA, 2021), 49th The Voice Foundation Annual Symposium: Care of the Professional Voice (Philadelphia, USA, 2020), 10th International Congress of Voice Teachers (Stockholm, Sweden, 2017), 23rd International Kodály Symposium (University of Alberta, Camrose, Canada), International Conference on Music Perception and Cognition - ICMPC15/ESCOM10 (Karl-Franzens-Univesität, Graz, Austria, 2018), Symposium on Research in Choral Singing (Northwestern University, Evanston, USA, 2018), EAS Conference (Jelgava, Latvia, 2018; Malmö, Sweden, 2019). She delivered papers in Hungarian at the following conferences: HuCER (2017, 2018, 2019), ONK (2018), 2. Conference in Art Pedagogy (ELTE, BTK, Budapest, 2018), International Music Conferences (2017, 2018, 2019, SZTE Szeged).

Szeged, September 18. 2022.

Dr. Asztalos Andrea PhD
associate professor

I.
THEORETICAL BACKGROUND TO SINGING VOICE PRODUCTION OF CHILDREN

1. THE PHYSIOLOGY OF SINGING VOICE PRODUCTION

The operation and control of the nervous system is the precondition of singing voice production. The flow of exhaled air, the phonic regulation, the tone, and vibration of vocal folds, as well as the functioning of the vocal tract as resonator, serve as the physiological bases of voice production. Also, the quality of voice depends on individual features, as well as hormonal and psychological characteristics (Balázs, 2016).

The vocal tract consists of three parts and its operation has to be interpreted from a mechanical-acoustic, as well as from a physiological point of view. The mechanic energy is produced by a 'compressor', i.e., the lungs, then this mechanical energy is transformed into acoustic energy by an oscillator, i.e., by laryngeal activity, which will be spectrally modified by a filter-resonator. In a physiological sense the so-called 'primary sound" produced in the larynx is modified, finalized, and individualized by the sound producing cavity (resonator cavity). The physiological functions include (speech), breathing, phonation and articulation (Hirschberg et al, 2013).

The upper and lower parts of the respiratory tract are connected by a complicated system of laryngeal valves. The lower part of the respiratory tract includes the vocal folds (traditionally called vocal cords), above them the false vocal folds (cords), and on the top there are the aryepiglottic folds and the epiglottis, which are capable of closing the larynx (Hirschberg et al, 2013).

„Vocalization, sound production is the acoustic stimulus of the vocal tract, i.e., of the vocal or resonator cavity (with other words vocal tract) by a stream of air, which is spectrally characterized by resonance peaks, also called formants. The vocal tract, the vocal or resonator cavity, the articulatory cavity are synonymous, and they cover an area, a cavity, extending from the vocal folds (vocal cords) to the opening of the mouth." (Hirschberg et al, 2013, 94)

Singing is an ancient and instinctive form of human sound production, and, at the same time it is a very complex product of high culture, capable of influencing human thoughts and emotions alike. Various human communities have produced different forms of singing, a variety of styles and techniques. Despite their differences these varieties still represent a common language and have integrative power.

Singing is a conscious human activity, during which human voice is used to represent a variety of coherent pitch, tunes and musical lines. Singing is to express various thoughts, ideas, and emotions. Regardless of the fact that people sing or speak, or produce simple sounds, they use the same vocal and articulatory organs. At the same time there are significant differences between speech and singing. Contrary to fluent speech

production, singing voice can be characterized by lengthy voiced sounds, differences in pitch and volume determined by the music itself, the special use of the resonator cavity, consciously selected timbre (tone) and a special breathing technique, 'dictated' by the music. The singing voice in music is a product of great complexity, which is capable of transmitting moods, thoughts, and aesthetic meaning. The difference how speech, the simple singing voice and the musical singing voice is regulated by the central nervous system, have by now become better known for academics. During singing voice production those areas of the brain and those nervous paths become active, which are also known as the 'song-system' of the human brain (Hirschberg et al. 2013). In a musical sense it is only a human being who is capable of singing together. The human cerebral cortex functions as a „song system". This system can be divided into primary auditory (sound perception) and motor (sound production) areas, also secondary auditory and motor areas, as well as a cognitive area, which is of higher rank.

The singing voice itself is an acoustic phenomenon, which depends on a variety of anatomical and physiological factors. The voice comes into being due to the optimal coordination of breathing, the operation of the larynx and the resonator cavities. The series of functions and the correlation of the formerly mentioned organs (coordinator functions) represent the technical conditions of artistic expression. This network of functions consists of the following components:

a) breathing

The lungs are the organs where the breathing of humans takes place. Breathing is actually a gas exchange, a process, during which, when inhaling, oxygen gets into the blood, then, when exhaling, carbon dioxide leaves the body. Optimally, when the human singing voice is produced, it is the diaphragm that plays the central role. On inhalation the diaphragm descends and by doing so it pushes the organs below downward and outward. Due to this 'pressure', air flows into the lungs. On exhalation the diaphragm performs an upward movement, and the inner organs return to their original positions. (Prasser, 2012). It is the diaphragm and the outer intercostal muscles that play a role during the inhalation phase, while in the exhalation phase it is the inner intercostal muscles and the abdominal muscles that play a role instead (Hirschberg et al., 2013).

Due to the exhaled air the vocal cords of the larynx begin to vibrate. The moment of decision making to inhale is characterized by lively intellectual activity. All those connections of the association centers become active, which comprise all the factors (rhythm, pitch, tune, volume, tempo, text memory, mode of performance etc.) of the work of music to be performed. (Prasser, 2012).

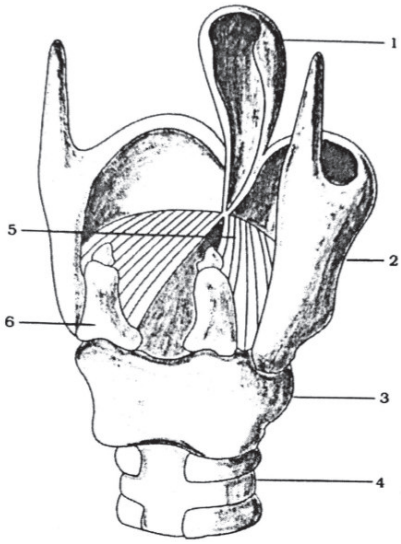
Four breathing types can be distinguished.

On a*bdominal breathing* the diaphragm becomes tense, its dome flattens, thus making the lower lung lobes to dilate, and, at the same time, putting pressure on the abdominal cavity. As a result, the abdomen protrudes. At the same time the lower ribs rise, and the volume of the chest increases. This is why if the diaphragm is active on inhalation, in addition to abdominal movement, the chest also increases/decreases its volume to a certain extent. The most typical feature of *chest breathing* is that the ribs rise then subside. The outer intercostal muscles make the arches of the ribs rise; thus, the volume of the chest increases both frontally and sagittal. C*hest-abdominal* breathing is the physiological form of breathing. *Shoulder-breathing* (high breathing) is characterized by the movement of the upper ribs and the collarbone, a type of breathing, which, in its isolated form is considered pathological (abnormal). (Hirschberg, 2013). It is important to note that the majority of children use shoulder breathing (high breathing) when singing, a feature, which needs to be immediately corrected. Teachers are to aim at demonstrating and teaching chest-abdominal breathing to them.

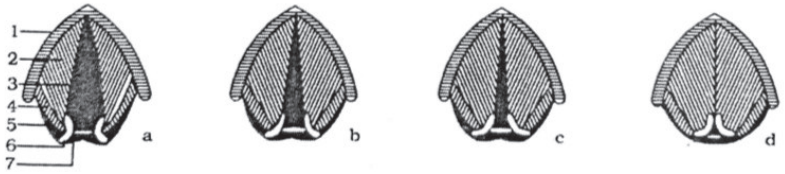
The task of the diaphragm, as an inhaling muscle is to 'support', to slow down exhalation i.e., fine-tuning of the air flow in order to assist musical expression.

b) Larynx

The position of the larynx is an important factor in the network of functions. In the process of voice production, it has to operate in accordance with the pronounced text, the tune and its physiological connections. Since the muscles, in charge of the attunement of the vocal cords, are indirectly connected to the laryngeal muscles, their natural movement has a great influence on the operation of the sound producing organ. The clear and flexible state of the larynx can only be granted by the coordinated operation of all respiratory- and phonation muscles. (Adorján, 1996).



1. epiglottic cartilage, 2. thyroid cartilage, 3. ring cartilage, 4. C-shaped cartilage rings of the initial part of the windpipe, 5. vocal cords with the glottis between them, 6. arytenoid cartilage
Figure 2. The anatomy of the human larynx (Adorján, 1996)



a. undisturbed inhalation b. breath, c. whisper, d. production of voiced sound
1. thyroid cartilage, 2. vocal cord, 3. glottis, 4. ring cartilage, 5. vocal cords adducted, 6. arytenoid cartilage, 7. vocal cords abducted
Fig. 3. The shape of the glottis (Adorján, 1996)

c) Starting a sound

Starting a sound begins at the moment of exhalation and its correctness is closely related to the precision of inhalation and exhalation as well as to the functioning of the pairs of vocal cords.

d) Resonators

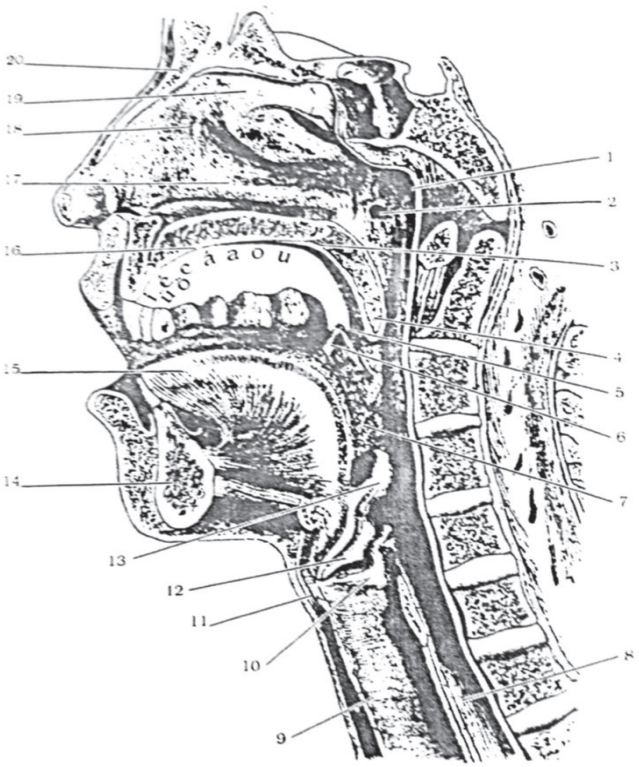
Without resonators the sound produced in the larynx would be barely audible. Resonators have an impact on the tone, as well as on the dynamic features of the given sound. This feature of the human sound means that it is an undividable unit. When

producing lower sounds, it is the chest, and, when producing higher sounds, it is the head resonance that plays the most significant role, but, with correct sound production, the sound blends all simultaneous resonances with much precision and correctness. The correctness of breathing, the operation of the larynx, correct sound production and the appropriate tuning of the sound in the mouth cavity are all functions related to one another in a chain-like way; they are all factors of significance in creating ideal resonance conditions. (Adorján, 1996).

The study of resonance conditions is, at the same time, research in phonetics since a sound is a steady-state tune within the framework of a language. Phonetics in music differs from the phonetics of speech to the extent that singing can be perceived as a magnified version of speech at a definite pitch level; consequently, singing can be characterized by more intensive volume, larger register, and a more varied range of coloring, the quality of these factors influences the value of the final artistic product. (Adorján, 1996).

The four basic features of sounds can be detected both in speech and also in singing. They are pitch (tunes), volume, length of sound (e.g., rhythm), and tone. All these features are closely interrelated. The pitch of the singing voice is given by the frequency of the periodical vibration of the vocal cords, a quality, which primarily depends on the flexible tension of the vocal cords. The volume depends on the strength of the air pressure, quantity, and the size of the amplitude, i.e., the width of the vibration of the vocal cords. The length of the sound is determined by the length of time of the mingling of exhalation and periodical vibration. The tone of the sound depends on the air-filled cavities, the so-called resonator cavities, which can be found below and above the larynx. The lower, (subglottic, below the vocal cords) resonators tend to play a role in determining the singer's individual tone. The upper (supraglottic, above the vocal cords) resonators determine the specific tone, typical of the given sound. The vocal tract, which is the extension of the larynx in the mouth cavity has different parts and each of them plays a different role. The part which can be found in the mouth cavity serves to form speech sounds while those parts which are located directly above the glottis create varieties of ringing. The vibration of vocal cords without the modification of resonator cavities is called voice. When the primary sound reaches the upper resonator system (throat and mouth cavities) and where the higher sounds become stronger, in the various formant areas of the cavities vowels will come into being. In the area extending from the middle of the palate towards its rear parts, the dark vowels are shaped, i.e., the various types of á-a-o-u. (There are variants depending on the phonetic rules of the individual languages, for example whether or not the lips are rounded.) (Adorján, 1996,). In the area, extending from the central part of the mouth cavity toward the incisors the different versions of e-é-i-ö-ü sounds are formed along the ridge of the palate; when producing the ö and ú sounds the lips are rounded, too.

When producing the vowels, the vocal tract is an open tube in the mouth cavity, so the sound, produced by the vibrating vocal cords is not blocked by anything. (Adorján, 1996).



1. naso-pharynx 2. eustach horn, 3. soft palate, 4. uvula 5. pharyngeal arch, 6. pharyngeal tonsil, 7. lower pharynx 8. esophagus 9. trachea, 10. vocal cord, 11. thyroid cartilage 12. arytenoid cartilage, 13. epiglottis, 14, jawbone 15. tongue, 16 hard palate, 17. nasal concha inferior, 18. middle nasal concha, 19. nasal concha superior, 20. nasal bone
Fig. 3. Middle plane section of the head (Adorján, 1996, 21)

When consonants are being produced, certain types of blocks come in the way, thus, due to this obstacle, the sound, produced in the larynx mingles with the noise of the vocal tract. This is how voiced consonants come into being including b, d, v, z etc. m, n, ny are exceptions, because, although they are voiced consonants, the murmur coming from the vocal tract does not take part in their production. When they are being formed the soft palate does not rise, so their tone is given by the resonance of the nasal cavity. They are called nasal consonants. The other consonants, including p, t, k, f, s

etc. are the voiceless ones, because when they are being produced, the vocal cords are in breathing position, so, it is only the vocal tract and the mouth cavity that represent an obstacle for the exhaled air. The consonant h is an exception since it represents pure murmur (Adorján, 1996).

In summary it can be stated that singing voice is extremely beautiful when breathing, the larynx, the sound starting functions, resonance conditions as well as the phonetic phenomena of choral music are all correctly performed. The production of sounds cannot be separated from permanent and consistent music education. Since the teaching of the elements of music requires a different perspective in every age group, voice production also has to be aligned to learners' age-related specificities.

2. THE ACOUSTICS OF THE PRODUCTION OF SINGING VOICE

When singing the articulatory configuration of sound production is changing, consequently, the acoustic structure of sounds also changes (Deme, 2011). Pitch is primarily determined by vowels, and therefore researchers have always focused on the investigation of sung vowels. It was the Swedish Johan Sundberg, who was the pioneer of research into the articulatory and acoustic nature of sounds in speech and singing. It was the high pitch sounds that he was primarily interested in, and he investigated those characteristic features, which might play a role in the process of speech perception and speech production.

In relation to the articulatory characteristics of singing sounds, in Sundberg's view, the larynx has a lower position in the vocal tract. As a result, the pharynx, as well as the laryngeal tube expand, and, as a physiological compensation, the jaw opens at a greater angle, the lips also open widely, and the shape of the vocal tract tends to become similar to the one used when producing the 'a' sound. The aims of these articulatory characteristics are as follow: 1. to produce high pitch sounds without damage to the organs 2. the production of 'beautiful' singing voice (comprising the adequately intensive acoustic components); 3. the production of intensive singing voice, audible without amplification even when accompanied by orchestral music. (Deme, 2011).

Having overviewed the acoustic features of singing voice it can be stated that there are several changes in the acoustics of vowels when compared with the vowels of natural speech. In case of high pitch both the value of formants, necessary for vowel identification, and the proportion of formants change. (Deme, 2011).

Children's speaking voice is considerably different from that of adults, since their speech organs are still in the phase of great development. Also, children's speaking voice largely differs from that of the adults, because of differences in body size. Due to their smaller height their vocal tract is shorter, too, and when producing vowels, this feature results in higher formant values. (Fant, 1966; Nordström, 1975; Gósy, 1984; Huber, 1999; Lee et al. 1999). The formants in this case represent beams of murmurs, overtones as intensified by the resonances of the vocal tract, acoustically characterizing the quality of vowels. The first two formants do actually determine the given vowel. (Gósy, 2004). In children's pronunciation (partly due to higher formant frequencies) the acoustic vowel space is larger, too, meaning, that vowels are to a large extent distinguished along formant values. (Lee et al, 1999; Vorperian and Kent, 2007; Deme 2011). The acoustic vowel space can be defined by the area enclosed by the points of the

coordinates of the first two formant values. The most distant points in the Hungarian language are in case of the vocal sounds of i, á, ú. (Deme, 2011).

The softer, more flexible, and smaller larynx of children has naturally shorter vocal cords. The length of vocal cords at birth is 4–8 mm, while in adult women it is approximately 21 mm, in adult men it is about 29 mm (Welch and Howard, 2002). Due to this feature the base sound of children is higher in pitch than that of an adult speaker. (Nordström, 1975; Lee et al, 1999). It is not only the size of the vocal tract, but also its shape that can differ in children, depending on their age and level of development. (Nordström, 1975, 1977; Deme, 2011).

As children are growing, together with their physiological and mental development, their speech production, as well as its acoustic projection also change. It is a general tendency due to the growth of the vocal tract and the lengthening of vocal cords that the value of F0 and also of the formants decrease. The acoustic vowel production space will be shrinking, too. (Lee et al, 1999; Vorperian and Kent, 2007; Deme, 2011). There are differences in the growth and development of boys and girls, consequently, at a given age significant differences can be detected between them concerning the acoustic characteristics of speech. Based on American data, researchers have found that the pitch of base voice and its decreasing tendency occurred at the age of 12, while F2 and F3 patterns, more typical of the physical characteristics of speakers can be differentiated between boys and girls at the age of 11. (Lee et al, 1999, Deme, 2011). At the age of 8, children's speaking voice does not yet show the characteristics of formant-value characteristics, typical of adults. These values will only be detected in girls at the age of 14, while in boys the values will reach the same level only at the age of 15. (Lee et al, 1999). At the same time, it is important to note, that by the 8th year of life the vowel system has already been acquired, meaning, that the child has all those sounds at his or her disposal, which can be identified in the basis of articulation of his or her mother tongue. (Gósy, 2005).

The formants of a child's vocals are higher than those of adult average, or of an adult woman, and the acoustic vowel space is wider than that of the previously mentioned groups. (Deme, 2011).

The spectral division of children's and adults' singing voice is different. In case of children there is lesser growth in intensity in the higher frequency zone, on the other hand there is more intensity growth in the lower (the first three) frequency zones. As a result of the lower intensity of the upper frequency zone it can be concluded that children's voice is quieter, less intensive compared with the voice of adults. This feature probably leads back to the less developed speech organs and the lower level of the development of children's singing voice production, i.e. they do not feature the articulatory characteristics typical of classical singing, which are acquired in the process of voice training, i.e. the lowering of the larynx and the narrowing of the vocal tract. (Deme, 2011).

3. THE CHARACTERISTICS OF CHILDREN'S VOICE PRODUCTION

3.1 The characteristics of singing voice production in childhood

Considering the physiology of voice production of children and adults there is no significant difference between them, but the growth and development of a child's body, especially the changes of the scale relation of the head and body and the characteristics of a child's pre-puberty development are all features, that have an impact of significance on singing voice. Concerning the scale relation of the head and the body in case of a newborn child, this relation is 1:1, while an adult features a scale proportion between 1:5 and 1:7. During growth the human trunk undergoes more radical changes than the head. In case of height increase the voice production organs also undergo a developmental change. Bodily development is uneven until puberty, but it is continuous, and the development of voice production organs and muscles is relatively simultaneous with these changes. (Surján and Frint, 1982; Hirschberg et al, 2013). The size and the scale relations of the body have an influence on the tune and register system of the voice.

The period before puberty can be divided into four developmental phases: 1. infants and young children (aged 1-3 years), 2. preschool children (aged 3-6 years), 3. lower primary school children (aged 6-10 years), 4. upper primary school children (from 10 years of age to puberty) (Mohr, 1997).

According to Paul Nitsche's (1969/1970) investigations the development of children's sound range is as follows:

- infants and young children: g'-c"
- preschool children: f'-e"
- lower primary school children: c'-f" (c"')
- upper primary school children: a- a" (c"')

Before they reach puberty the resonator cavities, voice production organs and the vocal cords of boys and girls are very similar both in size and structure. It is important to note that the size and scale relations of the body have an impact on both the tune and the register system of the voice. Concerning its tune, range, and expressive power the singing voice of children is different from that of adults. Children's voice has lower volume, they are able to hold the sound for shorter time and the singing sounds are higher than in case of adults. The teaching of musical elements varies in its approach from age to age, accordingly, the development of singing voice production always has to be adapted to the specificities of the age.

3.2 The development of singing voice production in childhood

In their investigations Hacki and Heitmüller (1999) noted that from 4 to 12 years of age the performance of speech voice improves with the advancement of age, although this development is uneven. The pitch deepens at around the age of 7-8 in case of girls, and at around the age of 8-9 in case of boys. Maximum intensity of voice gradually increases from the age of 4, but at around 7 it stops. In the group of children from 4-12 years of age there is no significant difference between boys and girls concerning their singing voice. The sound range increases in both directions, in case of high-pitched and low-pitched sounds as well. The maximum of singing voice intensity depends on age and sex: in case of girls it increases up to the age of 9, then, after 10 years of age it begins to decrease. In the group of boys it increases until 10 years of age, and it begins to decrease only after 11 years of age. Hacki and Heitmüller (1999) concluded, that girls between 7 and 8 years of age, while boys between 6 and 9 years of age undergo a period of premutation. This fact needs to be considered in choir singing. According to Seider from 7 to 14 years of age the average sound range between d and f" is slightly more than 2 octaves.

In addition to the base frequency of speech, with the advancement of childhood other parameters of sound performance also change, including sound range and sound dynamics, volume, and the ability of holding sounds. (Hirschberg et al, 2013).

Fuchs and other authors have found that those children, who were active singers did have a wider range of voice, the maximum sound pitch and volume were higher. Children, who were choir singers usually produced 'more musical' lengthy sounds, they pressed their sounds less, and used more air. With other words, between 10 and 17 years of age, both boys and girls, who regularly sang in choirs and trained their voices, could sing at higher pitch, louder and lighter than those contemporaries of theirs who were not active in singing. (Fuchs et al, 2006).

The following table features the range of pitch of children with trained/untrained voice. The data were compiled by Fuchs and his fellow researchers. (Table 1.)

Table 1. Sound range in children with trained and untrained voice in different age groups indicated by the number of half tones. Based on data by Fuchs and his colleagues-researchers *(2006) (source: Hirschberg et al, 2013, 214)*

<table>
<tr><th colspan="2">Untrained voice</th><th colspan="3">Trained voice</th></tr>
<tr><td>Sound range in half-tones</td><td>Literature</td><td colspan="2">Sound range in half-tones</td><td>Literature</td></tr>
<tr><td>8 (7-year-olds)</td><td rowspan="2">Paulsen (1900)</td><td rowspan="5">Boys</td><td>31-32 (1-2. soprano)</td><td rowspan="2">Frank (1978) (Wiener Sängerknaben)</td></tr>
<tr><td>20 (14-year-olds</td><td>26-29 (1-2 alt)</td></tr>
<tr><td>16 (7-year-olds)</td><td rowspan="2">Fröschels (1920)</td><td rowspan="2">29 (9–13-year-olds)</td><td rowspan="2">Holtmann (1986) (Töltzer Knabenchor)</td></tr>
<tr><td>26 (14-year-olds)</td></tr>
<tr><td>21 (boys)</td><td>Naidr és mtsai (1965)</td><td>31-31 (1-2. soprano)</td><td rowspan="2">Fuchs (1997) (Thomanenchor Leipzig)</td></tr>
<tr><td>20-23 (7–14-year-olds)</td><td>Frank – Sparber (1970)</td><td>27-31 (1-2. alt</td></tr>
<tr><td>27 (7–9-year-olds)</td><td rowspan="2">Hacki – Heitmüller (1999)</td><td rowspan="4">Girls before and after rehearsals</td><td>27,5-29 (10–11-year-olds)</td><td rowspan="4">Narewski (1999) (MDR Kinderchor)</td></tr>
<tr><td>29 (10–12-year-olds)</td><td>31-33 (12–13-year-olds)</td></tr>
<tr><td rowspan="2">29 (7–10-year-olds)</td><td rowspan="2">Böhme – Stuchlik (1995)</td><td>32-32 (14–15-year-olds)</td></tr>
<tr><td>30-30 (16–18-year-olds)</td></tr>
<tr><td colspan="5">untrained – trained: 24 half-tones by Berger – Walde (2002)</td></tr>
</table>

Children's voice is not a 'miniature' adult voice. In case of children the subglottic pressure (Keilmann, 1995) and the mouth cavity pressure (Stathoppulos, 1986) measured during voice production is larger than in case of adults. Similarly, to adults, children aged 4-8 years of age produce increasing glottic air flow when producing quiet, medium loud and loud sounds. The necessary quantity of air and volume is compensated by a younger, small-bodied child of lesser vital capacity with more frequent inhalation on the one hand, and, on the other with an increase in his lung capacity by making increasing expansions during sound production. In Titze's opinion (1994) the compensation for lesser vital capacity and shorter vocal cords requires much effort from children. Therefore, to some extent the tense, strained, hyperfunctional voice production of children is a physiological phenomenon.

4. THE IMPACT OF SINGING ON CHILDREN

The advantageous effects of singing can be seen in the most diverse areas and in different age groups from preschool age children to old age pensioners. If music education is appropriate and practice-oriented, music competences will definitely always develop. Almost without exception each person can sing and enjoy singing throughout a lifetime. The advantageous effects of singing have been proven by research in five main areas:

- physical
- psychological
- social
- musical
- educational

The physical impacts of singing are as follow:

1) Singing has a significant effect on breathing and the heart, it is a physical exercise, too, a kind of aerobics, so it improves the cardiovascular function of the body, and it has a proven positive effect on people's general state of health. The aerobic activity increases the oxygen level of the blood and stimulates alertness. Singing involves chest activity, it is the basic structure and function of breathing mechanism. It activates most of the muscles of the upper body. In addition, singing as a physical activity, greatly contributes to decreasing stress levels, good health throughout one's life and has a positive effect on the longevity of life. (Welch, 2010, 2012).
2) Singing promotes the improvement of the control of fine and gross motor skills.
3) Singing has an impact on the operation of the nervous system, including the development and interaction of the cerebral hemispheres. (Welch, 2010, 2012).

The psychological impacts of singing are as follow:

1) With the help of music both intrapersonal communication and individual identity develop. Using one's voice self-confidently and in a healthy way has a positive impact on people's self-image and communication skills. Success in singing supports self-esteem as well as general confidence, Voice is an element of key importance in knowing who we are. Voice is a reflection of mood and psychological wellbeing. Furthermore, it is a significant tool of communication with others.
2) Singing is a cathartic activity, and it is a way to express a variety of colorful emotions. Due to the physical activity involved in singing and the operation of the

endocrine system during singing, the singer feels much better and happier than other people.
3) Singing is a tool of utmost importance in interpersonal communication. (Bailey and Davidson, 2005; Welch, 2012).

The social effects of singing are as follow:
1) Singing improves the singer's social empathy.
2) Good singing ability is closely related to positive empathy and a sense of community. Singing with others provides better chances for singers to relate to others emphatically.
3) Singing with others (in choir or in chamber choir) strengthens group cohesion. (Welch, 2010).

The musical effects of singing are as follow:

1) Singing is a way to fulfil music opportunities. Singing represents an excellent possibility to understand musical expressions and phrases, in addition, the singers' tone sensation and memory also develop through musical repetitions and variations.

2) Singing helps to create an individual repertory and formulate a unique and individual musical taste. (For students, or performers, or both). (Welch, 2012).

The educational effects of singing are as follow:
1) The knowledge and understanding of the surrounding world are strengthened in music and by the music.
2) Singing helps to become a better reader and a better speaker in one's native language. Sign decoding, necessary for reading texts and reading music takes place in the same neural region (Welch, 2012).

The formerly mentioned positive effects when taken together underline the idea that singing is one of the most useful forms of human activities, because it supports physical, mental, and social health and, at the same time, it guarantees individual development. Singing is important, because it develops self-confidence and self-esteem, and, in addition it involves emotions, social empathy and supports the development of social abilities. Singing enables children and young people of various abilities from different age groups to do and create something artistic and special together.

5. THE DEVELOPMENT AND TESTING OF SINGING ABILITY

In accordance with Zoltán Kodály's principles, music education in Hungary is based on the singing voice. It is an instrument, available for everyone, a significant tool of providing experience and acquiring knowledge. The singing voice also has a great significance in the development of hearing and laying the foundation for musical literacy, and based on that, learning to play a musical instrument (Szőnyi, 1984).

5.1 The development of singing ability

In Kodály's opinion singing is the most natural way of active music making. In his view singing encourages and liberates the singer, it frees him from inhibitions, and it cures shyness. In addition, singing helps to concentrate, cures physical and spiritual disposition, encourages, and improves the quality of work and helps to get accustomed to discipline. Singing requires the activity of the whole person, not only one or another part of him. It develops community feeling and it develops a musical sense, the germ of which is carried by every human being. This way singing is capable of laying the foundation for understanding culture and thus it makes life better and richer (Kodály, 1974). When we play a musical instrument, when listen to music or remember a tune, we sing to ourselves. It is a fact, that has been proven by instrumentally testing the moving muscles of the larynx (Balser 1990, Habermann 1986, quoted by Gembris 2002).

In infancy the voice of the parents – in most cases it is the mother- and the baby's own voice are the most important voice experiences. This voice-mediated communication between mother and child works very well in early childhood, in infancy, before the child learns to speak. In an infant's voice production development, it is around one year of age when singing and speech get separated from one another. Initially, singing is nothing more than playing with the voice. Several researchers have concluded that the first manifestation of an infant's voice is of descending- glissando-nature (Gembris, 2006). According to Papousek (1994) in the period of early infancy, approximately from the age of 3-4 months, four melody contours can be distinguished in the voice communication of very young children. These are as follows: descending, rising-descending, rising and complex, i.e. rising and descending repeatedly. All these contours depend on the infant's age and the situation itself. The descending contour is typical of one-month-old babies, but later the 'melody' contour becomes more varied and, proportionately, the other types play a more important role. This type of nonverbal communication is built on the use of tone, pitch, intonation, volume, and tempo,

all of which are means of expression in music, too (Gembris, 2006). The separation of singing and speaking voice usually takes place at around the end of the first year. When playing with their own voice children discover the possibilities, effectiveness and the expressive power of their own voice, a characteristic feature, typical when a child is 12-18 months old. The two basic cognitive processes of assimilation and application are based on the activities of playing with the child's own voice. Application means that the child attempts to express his own experience in a given model, for example in the phrases of a song. Assimilation means that the child is given new input (a new tune, for example) and he inserts it in a familiar scheme (Stadler Elmer, 2000, quoted by Gembris, 2006.). According to Dowling's observations (1985, quoted by Motte-Haber, 1996) singing and baby speech can be differentiated from one another at around the age of 18 months.

During the second year of their lives children can already sing simple, short song phrases, but their interpretation often involves repetitions and improvisation (Moog, 1976, quoted by Gembris, 2006). The child catches one or another short detail of a song, and, when singing, alters it and turns to improvisation. Due to learning songs spontaneous song-like baby talk is pushed into the background and the intervals are increasingly similar to those of diatonic tonality.

From the age of three years children are increasingly better at singing by the ear. Klanderman (1979, quoted by de la Motte-Haber, 1996), when investigating the characteristics of the process of learning to sing from 3-5 years of age, concluded, that this age group still had difficulties with changing a tune when singing repetitive tunes within a song. In this case children tended to go on singing the same tune again and again.

By the age of 6 or 7 children will have been able to learn a song by the ear and sing it correctly (Davidson, 1994; Minkenberg, 1991). If they do not find the right sound it does not mean that they are unsuitable to perform the task or to recognize the right pitch (Goetze et al, 1990, quoted by Gembris, 2006).

According to Stadler (2000) the theories concerning the development of singing ability can be divided into three groups. The first group involves a speech-dominance theory, which means that songs are learnt by children on the basis of a certain order, i.e. lyrics, rhythm, melody contour, phrase and pitch. In the learning process children first learn the lyrics of a song, then they acquire its rhythm, melody contour, and eventually the pitch. At the same time, the interpretation of the song also develops gradually (Hargreaves, 1986; Moog, 1976; Welch & White, 1994, quoted by Gembris, 2006).

The second group has theories in it which are built on the importance of pitch. It means that children first learn the pitch within a song's melody. The pitch or the sounds have a special irreversible order, and it has a developmental effect; first they acquire prim and quint, followed by terz, quart and sext. This theory is based on the

regularities in an order of harmony (Metzler, 1962; Werner, 1917, quoted by Gembris, 2006).

The third group is the so-called contour theory. In this case the learning process begins with the contour of the melody, then it is followed by pitch and tonality. According to Davidson's (1994) contour scheme theory, the perception of melody begins with the perception of contours, i.e., the direction of the movement is the most decisive element in this process. The concept of the contour scheme refers to the typical tonal structure of the given song. Accordingly, children first learn the frame of a song, then they will gradually specify the pitch. During their development children are enabled to identify more and more details within a song (Gembris, 2006).

The spontaneous development of children's singing ability comes to an end at around the age of 8, and it cannot develop further without specific training and learning. Learning singing also gets stuck at this age and will not develop in adulthood either (Davidson and Scripp, 1990; Minkenberg, 1991, quoted Gembris, 2006; Davidson, 1994). Further music instruction and training are needed further on, a conscious and targeted development of musical abilities, including singing. Later on, singing ability develops through the refinement of musical, cognitive, and perceptive skills; the development of the fine movement of voice production organs is also of utmost importance.

5.2 The Measurement and Evaluation of Children's Singing Voice Development

The first initiatives to test singing voice development in children go back to the 1960s.

Smith (1961, quoted by Rutkowski, 1990) investigated the accuracy of pitch when singing by the ear. He used a four-point rating scale for evaluation:

1 = Complete lack of tone matching ability
2 = The child is able to sing only one of the two tones
3 = Complete accuracy but with a tendency to slide into either the first or second interval tone.
4 = Complete accuracy in reproducing an interval.

DeYarman (1972, quoted by Rutkowski, 1990) used four melodies to measure singing ability, which had to be sung back. He used a 7-point rating scale. The individual points of his rating scale are as follow:

1 = No correct response.
2 = No, or very poor sense of tonality, but general sense of direction.
3 = Poor sense of tonality, general sense of direction.

4 = Fair (moderately good) sense of tonality, good sense of direction.
5 = Good sense of tonality, very good sense of direction
6 = Very good sense of tonality
7 = Excellent tonal performance.

It has not been clarified yet what exactly this 7-point scale is intended to measure. Is it the correct use of singing voice, or the punctuality of intonation, or both?

Young (1971, quoted by Rutkowski, 1990) designed a test, which consists of 2 parts. In the first part of this test the singing voice is evaluated, while the second part focuses on singing abilities and tonality. This test tends to be descriptive rather than evaluative.

Robert and Davis (1975, quoted by Rutkowski, 1990) introduced a 5-point rating scale with the aim of singing voice evaluation.

0 point = Tune completely unrecognizable.
1, 2, 3 points = Part of tune recognizable.
4 points = Correct performance.

Since the authors did not identify the concrete criteria of evaluation, this scale may be considered as subjective and problematic.

Hale (Runfola) (1977, quoted by Rutkowski, 1990) created a 5-step scale in order to measure intonation:

1 = There is no sense of tonality, no accurate testing tone.
2 = Accurate resting tone at the beginning or at the end of a song.
3 = Tonic tonal patterns accurate.
4 = Dominant-seventh tonal patterns accurate.
5 = All patterns accurate.

Evaluation based on judgement by the ear is problematic as long as its underlying principle is pure observation, and its documentation is carried out empirically. (Gordon, 1976). Although Hale limited the material to be evaluated and he used only tonic and dominant samples, still, the reliability of his test has been very low.

Ramsey (1982, quoted by Rutkowski, 1990) constructed the Preschool Singing Ability Level Test to measure: 1. preschool children's ability to reproduce pitches in a specified vocal range and 2. preschool children's ability to reproduce a song. In the first part of the test each pitch is produced first in ringing tone, then in a singing voice, and, eventually, the children are asked to sing back the given sound in an echo-like way. Each participating child has three opportunities to perform the tasks correctly. In the second part of the test each child is asked to sing a song, freely chosen by him or her. The evaluator recorded all productions on a tape.

A 7-point rating scale was used for evaluation.

0 = The child made no response.
1 = The child used his speaking voice rather than singing the response.
2 = The child used his singing voice but sang incorrect general melodic contour, incorrect intervals, and exhibited no ability to establish or maintain a tonal center.
3 = The child maintained the general contour of the song but sang incorrect intervals and changed tonal center three or more times from that established at the beginning of the song.
4 = The child maintained the general contour of the song but sang incorrect intervals and changed tonal center two times from that established at the beginning of the song.
5 = The child maintained the general contour of the song but sang incorrect intervals and changed tonal center one time from that established at the beginning of the song.
6 = The child maintained the general contour and the beginning tonal center but sang incorrect intervals.
7 = The child sang accurately in regard to general melodic contour and correct intervals and maintained the beginning tonal center throughout the response.

This experimental scale is able to measure several parameters at the same time, namely, the use of singing voice, the accuracy of the melody contour of central tonality and intonation. According to Gordon (1971) a measuring scale reaches its top validity, when it focuses only on one aspect of the performance.

Rutkowski (1983, quoted by Rutkowski, 1990), similarly to Hale, improved her scale, but did not use a specifically designed set of songs for measurement. She used four levels to identify the accuracy of children's tonality. He developed a 5-point scale, similar to some of the previously mentioned scales, but he measured both the use of children's use of singing voice and the accuracy of intonation.

1 = Not in singing voice: voice shows speech inflection but not melodic contour.
2 = Voice shows pitch change and inflection (melodic contour) but no sense of resting tone or pattern accuracy.
3 = One tonal pattern sung accurately and/or a sense of resting tone exhibited.
4 = Two or more tonal patterns sung accurately.
5 = All tonal patterns sung accurately.

Feierabend's (1984, quoted by Rutkowski, 1990) 5-point rating scale was designed to measure the intonation and correctness of melodic contour and not only on the use of the singing voice. The samples were originally performed by a mezzosoprano. The

children first listened to the samples, then they were asked to sing them back in an echo-like way.

1 = Reproduction of the tonal pattern is not recognizable.
2 = Melodic direction is evident, but no tones are correctly reproduced.
3 = Melodic direction is evident, but some tones are incorrectly reproduced.
4 = The tonal pattern is correctly reproduced but with some uncertainly.
5 = The tonal pattern is accurately reproduced with good intonation.

All evaluation levels seem to be clear for a single use. In addition to the evaluation of the use of singing voice, this test focuses on the accuracy of melody contour as well.

Several measuring scales were designed to measure several types of singing voice performance and they did not measure the use of singing voice exclusively. Although, the quality of these scales has lately been improved, still, the majority of the scales has been designed to measure the use of singing voice and the accuracy of intonation together.

Rutkowski in 1984 designed a 5-point rating scale in order to measure only the use of singing voice:

1 = "Pre-singer" does not sing but chants the song text.
2 = "Speaking range singer" sustains tones and exhibits some sensitivity to pitch but remains in the speaking voice range.
3 = "Uncertain singer" wavers between speaking and singing voice, uses a limited range when in singing voice.
4 = "Initial range singer" exhibits use of initial singing range.
5 = "Singer" exhibits use of extended range.

The problem with this kind of evaluation is that the accuracy of intonation is difficult to disregard. This scale is still being improved.

The problem of the inaccuracy of pitch in singing has been in the focus of music teaychers for many years both from a theoretical as well as from an empirical point of view. Earlier attempts to solve this problem were based on intervention which might have helped learners to develop their abilities (Joyner, 1968; Yank Porter, 1977), or, concentrated on age-related changes in the area of incorrect performance and designed models with the aim of potential skills development (Welch, 1985, 1986). It was only in the last 10 years that music teachers acknowledged the importance of practice in the process of development and also focused on the level of difficulty of tasks when teaching their pupils how to sing accurately and clearly (Demorest & Clements, 2007; Nicholas, 2013; Welch, 2009). Additionally, teachers and researchers also investigated the use of singing voice (Rutkowski & Miller, 2003). Those academics, whose research areas include psychology and cognitive neuroscience are also interested in one type of

cognitive deficiency, i.e. adults' inability to sing using the accurate pitch. As a result, they began to investigate and tried to identify those circumstances, which might be the cause of adults' difficulties concerning their lack of accuracy in singing (Dalla Bella & Berkowska, 2009; Hutchins & Peretz, 2012; Pfordresher & Brown, 2007). Decisive pieces of missing information in this regard are as follow:

- it needs to be defined what is meant by the term 'clear and accurate singing'.
- it also needs to be clarified on how to measure it.

Most recent research regarding the topic of clear and accurate pitch and its measurement resulted in the Seattle Singing Accuracy Protocol (SSAP-2013). Its advantages are as follows: it contains multiple short tasks, which are easy to administer, the measurement process is easy to document, and the evaluation method is simple. The Protocol tests the singing voice in the so-called 'easy' range, then some imitation tasks and two singing tasks follow. This research deals with the issue of clear singing only in the range 'easy' for the tested person. The range can vary from 1-2 pitches to as many as 1.5 octaves. In addition, it focuses on the ability of singing back after listening to a song, the ability to distinguish between different pitches, and long-term memory. SSAP is still in the phase of further development and the elaboration of a matching online evaluation system is also planned (Demorest et al, 2015).

II.
THE PRACTICE OF CHILDREN'S SINGING VOICE PRODUCTION

1. A DISORDER OR A PROBLEM OF CHILDREN'S SINGING VOICE PRODUCTION?

In today's running world one can more and more frequently encounter children who suffer from some kind of voice disorder or problem. All these problems go back to incorrect body posture, breathing problems (high breathing or empty breathing), the malfunctioning of various muscles, overexertion, or, on the contrary, the limpness of the body, the inadequate movement of the lips or tongue, unnatural opening of the mouth. All these disorders may also go back to psychological problems, and they might have an influence on the development of children's personality as well (Asztalos, 2014). It is not the false note or false singing that is the essence of the problem, but it is only a symptom of another hidden trouble. These deeply rooted problems may include incorrect body posture, stiffness of the face or neck, feeling of pressure on the tongue's root, pharyngeal closure, unnatural breathing, articulation error, lack of imagination or simulation and all those psychological issues which can be found at the root of these problems (Dékány, 2017).

In voice production it is the harmonious connection between the ear, the brain and the sound producing organs that play a central role. In case there is no cooperation between these three areas, some errors and problems occur in voice production. (Mohr, 1997). When examining the characteristics of children's voice production, it is important to distinguish between sound production disorders and problems.

Specialist literature draws a distinction between voice production disorder (dysphonia) and voice production problem (dysodia) (Haupt, 2006; Surján and Frint, 1982; Lohmann, 1966). The functional disorder of voice production can be explained with some kind of neuromuscular disorder of the voice production organs. This malfunction manifests itself in an overstrained voice production, or, on the contrary, its feebleness. In the former case the sound producing muscles, or part of them contract excessively (hyperfunction), in the latter case muscle contraction is inadequate and the tone of the muscles decreases (hypofunction) In case hyperfunction relates to part of the voice production organs (e.g. breathing or articulation muscles) the disorder initially cannot be detected because the remaining voice production muscles compensate for the deficiency. In case the compensation is not enough, different types of coarseness will occur due to the disorder in the phonation mechanism and the operation of the larynx (Surján and Frint, 1982).

The error in singing voice production is also called dysodia. Occasionally it concerns one or another area of the vocal range (high or low notes) and there are cases when it can be detected constantly, or, in other cases, it is only periodical. There are

cases when the singing sound loses its usual lightness, or soft singing causes problems. The occurrence of dysodia can be explained by incorrect use of voice, faulty singing technique, and overstraining of the voice, especially in periods of upper respiratory catarrh. Stress, problems fears (especially of the failure of faulty sound performance or of some laryngeal disease) can serve as predisposing factors. In this case, people may complain about feeling pressure in the neck, squeezing, scraping or itching feeling in the neck, which are of exceptional intensity during and after increased use of the voice production organs (Surján and Frint, 1982).

The disorder of voice production (dysphonia) is likely to occur in the following cases:

1. In case the child's speaking voice
   - is much lower than that of other children of the same age
   - is much higher than that of other children of the same age
   - is sharp, uses squealing sound
   - is too quiet
   - is too loud
   - is whispering, stuttering, almost inaudible
   - sounds compressed, and extremely tense
   - sounds coarsely
   - sounds huskily
   - sounds unexcitingly, monotonously
2. In case the child inhales audibly and hastily.
3. In case the child gabbles, speaks too rapidly.
4. In case the speaking voice is distorted, ununderstandable.

If children's speaking voice is coarse, compressed, or too low, they cannot find the right note when singing. During a lengthy, more permanent use, muscles get extremely tired, and it becomes impossible for them to close vocal folds fully. It results in airy and tired voice and hurried inhalation.

Hyperfunctional dysphonia is the most frequently occurring form of voice production disorders in children, a condition, which is based on overstraining the speech organs and, it means that the vocal folds are strained all the time.

Children suffering from speech production disorder:

- have restricted communication skills
- cannot express their feelings and emotions adequately
- have problems speaking
- are reluctant to read aloud at school

- often they do not sing together with other children because they have problems with finding the proper notes (This phenomenon should not be mixed up with the so-called 'murmur' singing!)

While disorders of voice production are clearly detectable in speech (e.g. whispering voice, coarse voice) they also have an impact on singing voice and in order to improve them phoniatric and logopedic help is needed; errors in voice production are primarily seen in singing voice, but, to a lesser extent, they can have some influence on speaking, too. (e.g. airy or veiled voice).

It is quite customary that children struggle with some kind of problem or error in voice production. The reasons are varied, and they can be as follow:

- Respiratory diseases (acute or chronic respiratory diseases, allergies, asthma, pseudocroup, cough), all of which frequently have a significant impact on the voice development and voice production skills in children.
- The lack of practicing singing leads to a situation when the voice perception and voice production are not coordinated (Fischer, 1993; Nitsche, 1969/1970). In case children do not sing or sing only rarely, they will not be experienced in voice production.
- Imitation of faulty, bad models (e.g. the imitation of the singing of certain pop singers who might sing with pressed, or nasal or coarse voice) (Nitsche, 1969/1970). Many youngsters find their way of vocal self-expression in the imitation of the voice of their favorite pop star. They achieve this aim through significant expenditure of force (pressing, straining) or overemphasizing certain areas of resonance (e.g. isolated chest register or nasality), or, giving out empty-sounding childish, or using rude, coarse voice.
- „High breathing" (Shoulder breathing). In case of high breathing in most cases it is the chest- and intercostal muscles that are used during inhalation. The visible sign of it is the raising of the chest and the shoulders. The upper ribs grow and rise in order to inhale as much air as possible. In the meantime, the diaphragm does not participate actively in the breathing process, or, if it does, its role is minimal. The consequences of this situation are as follow: too loud inhalation, short breath - breath has enough air only for a very brief motif, highly positioned larynx; too low singing, hard beginning, rude, coarse, pressed sound production (Mohr, 2013). Taking deeper breaths is prevented by too much sitting – in the kindergartens or at schools. In order to normalize breathing it is absolutely necessary to do physical exercises in order to correct bodily posture, to relax. For teachers it is of utmost importance to teach and repeat correct breathing techniques and to use pictures, movement, and imagination.

Both the languidness or, on the contrary, the highly strung condition of the body can cause problems in voice production. After a time, children's voice can be developed step by step, gradually, depending on the age. Voice production errors, problems can be corrected with the help of adequate exercises, targeted improvement techniques, and with much patience and perseverance. In order to cope with this task successfully voice-trained teachers, choirmasters, and specialists of voice production are needed who are well informed about the specific characteristics of children's voice training very closely (Asztalos, 2014).

2. PROBLEMS OF SINGING VOICE PRODUCTION IN CHILDREN AND POSSIBILITIES FOR THEIR CORRECTION

This chapter is aimed at introducing the author's practical experiences in this field. She has gained expertise during her more than 20 years of teaching and voice training of children. She also aims to explain the details of her longitudinal research of several years. Singing voice production errors in children are as follow:

- too airy or veiled singing voice
- compressed singing voice
- singing exclusively in the chest register
- singing in thin chirpy voice
- singing in harsh „screeching" voice
- out of tune singing

2.1 Characteristics of too airy or veiled singing voice and possibilities for its correction

This type of voice production problem is caused by the inadequate closure of the vocal folds thus the air escapes audibly. There are additional problems with body posture, breathing, articulation, as well as sound. All these factors, when interacting, will lead to the previously described group of problems in singing voice production.

The body posture of children, who sing in an airy voice, is flabby. Their breathing is the so called 'high breathing', or 'empty breathing', a type of breathing which lacks air support. Articulation is incomplete, lips are relatively inactive and flabby facial expressions are typical in this group of children. Due to these characteristics their singing voice is veiled, airy, its volume is low, and they feature intonation problems as well. These children can sing only a very brief tune with one breath.

The very first task to correct these problems is to improve the body posture. It is important to straighten it and to pay attention to inner spaciousness. In order to achieve these aims it is essential to activate the body with intense, lively and energetic movements. (e.g. pulling or circular motions). Breathing can easily be corrected with staccato exercises. In order to raise awareness in correct breathing the following images and ideas can also be helpful: 1) Singing imagining inhalation, but without with holding the air! Imagine pulling motions, and in the meantime, the sound flows in (inalare la voce, non dare). 2) When singing, the flame of an imaginary candle placed in front

of the mouth is not supposed to go out. In order to improve articulation, it is necessary to call children's attention to the correct opening of their lips. They are supposed to be elongated and narrow. The imitation of chewing can be useful when correcting articulation problems. Other articulation exercises include those ones, in which the intensity and agility of consonants are emphasized. Airy singing can best be corrected by using breathing exercises focusing on the combination of the vowels of i, é, ö, ü, and the consonants of b, d, g, c, r.

The following forms of movements can also contribute to the elimination of the airy voice problem: tiptoeing, walking backward in the classroom, and, at the same time, lifting, or carrying a 'suitcase', 'chewing' when singing. It is also useful to raise the sternum by 1 centimeter and perform pulling or circular motions.

It is also useful to play various 'characters' for example, affective, dramatic, energetic persons, and imitate their speech and way of singing.

Table 1. Characteristics of too airy or veiled singing voice and possibilities for its correction (Asztalos, 2014, 2018) – own research / own editing

„TOO AIRY" or „VEILED SINGING VOICE"		
	PROBLEMS	CORRECTIONS OF PROBLEMS
posture	shrunken posture	straighten of body posture; body-posture activation
breathing	poor breathing support; high-breathing	inhale with wondering; staccato exercises; sing with feeling of inhalation; sing with feeling of draw
articulation, lips activity	small lips activity; poor mimic; poor articulation	mouth opening (long, narrow); chewing movements; articulation exercises
sound	too airy; veiled voice; little voice volume	vocal exercises with following vowels: „i", „e", „ü" and the most conductive consonants: „b", „d", „g"„r"; affected, dramatically singing; sing with different timbres; sing songs with more cheerful or more verve characters

2.2 Characteristics of compressed singing voice and possibilities for its correction

During singing in compressed voice the pressure of blowing the air is too strong and it opens the vocal folds wide apart; this condition leads to a crackling sound. The body posture of children singing in pressed voice can be characterized by the following: tense body with frequent knottiness in the shoulders, knees, hands, and throat. The shoulders are raised high up, head and chin are stretched forward, and the movement of the head follows the tune. The abdominal wall is tense. The breathing of these children can be characterized with excessively strong air pressure, consequently, the vocal folds are wide apart. Another typical characteristic feature of this condition is the so-called 'high breathing' and the passive diaphragm that goes with it. These children sing with stiffened facial expressions. Their singing voice can be characterized by forced pressed voice production, file-like noises, excessive volume, lack of flexibility, hard sound start, and frequent shifts in register (voice breakage). The narrow range of sounds low pitch, intonation problems, and inadequate head resonance also belong to the group of typical features.

The first task in order to correct these problems is the improvement of body posture. It is essential to hold the head in the correct position. The lower jawbone and the facial muscles need to be relaxed together with the relaxation of the whole body with the help of different exercises. (e.g. walking, shaking motions starting with the knees and hands, small movements of the head (showing 'yes' and 'no', 'right' and 'left'.) In order to correct breathing it is inevitable to relax the abdominal wall and the use of the following ideas and mental images. 1) 'breathe' the sounds, send air with them, but, without exhalation 2) air should not get stuck, it is flowing instead. 3) sounds are soft and velvety; they are caressing them. Articulatory exercises are also useful. and the best vowels to use include are u, o and a, and the best consonants to practice are p, t, k, f, s, sh, m, n. It is also of utmost importance to acquire new listening skills and habits together with the more frequent use of head resonance during singing. Children also need to abandon their high volume, their 'forte' and, instead, it is desirable for them to 'caress' the sounds by starting them gently and softly. Light and playful exercises and the singing of soft songs are the desirable activities.

Table 2. Characteristics of compressed singing voice and possibilities for its correction (Asztalos, 2014, 2018) – own research / own editing

„COMPRESSED" SINGING VOICE		
	PROBLEMS	CORRECTIONS OF PROBLEMS
Posture	stiff, strained posture; cramped neck, shoulders, hands, elbows and throat; strained and tense ventral- wall; too raised head; high-ranking larynx; hoisted shoulders; protruded chin, mandible	correction of body-posture; correction of head-posture relaxation of mandible; relaxation of face-muscles; bodily relaxation, small head-movements (yes-no, right-left); going; shaking-movements (hand-, and elbow-movements)
Breathing	inactiv midriff	relaxation of respiration breath is not damed breath flow, stream
Articulation, lips activity	stare facial expression	articulation exercises;
Sound	cramped and pressed singing voice; poor head-voices; raspy-voiced; too big volume; poor flexibility; hard tone starting; register-divergence little voice register; intonation problems	sing softly; sing with movements; vocal exercises with following vowels: „u", „o" and the most conductive consonants: „p", „t", „k"„f", „s", „m", „n"; sing with more head-voice; sing songs with facile and softly characters

2.3 Characteristics of singing exclusively in the chest register and possibilities for its correction

This problem in voice production is caused by an exaggerated use of chest resonance and an overemphasis of the chest register.

As far as bodily posture is concerned it is characterized by overexertion, tense position, with shoulders pulled up, head raised, lower jawbone pushed forward. Breathing is typically performed in the upper section, a type, which can be called 'high breathing'. When articulating, lips are opened too widely, and it is very deceptive; it gives the overall impression that the singer is very active and enthusiastic. Singing voice in this case is too loud, too low, bulky and sounds rude. In addition, it is characterized

by the lack of high sounds, meanwhile the sound gets broken when changing register, consequently, it becomes impossible to sing in one register. The sound itself is less flexible and animated, it has only a few possibilities to express dynamism and emotions. The sound is bulkier, but ruder, than pressed sounds. Attention! Children, singing in isolated chest voice are seemingly active and enthusiastic, but the above described features actually signal the presence of a serious error in voice production, which might affect the production of speech sounds, too, causing severe vocal cord problems.

When trying to correct these problems the first and most important task to do is to pay attention to the correctness of body posture. Certain types of exercises are of extreme significance to achieve our aim. (i.e. dynamic, uninterrupted movements; movements leading away from the body, shaking of the body, relaxation exercises, standing on one foot.) From the point of view of breathing 'deep' breathing, conscious diaphragm breathing and the activation of the diaphragm. In order to correct the singing voice, it is necessary to give up singing in low 'lage' temporarily, and it is forbidden to sing in low forte. The „mezza voce" is recommended and singing always begins with piano. The development of the voice begins with the head register, and the exercises go from the top down: glissando-exercises are important, practicing the m, ng, u, o, ü sounds. The vowels i, é, ü, ö, u, o and the consonants n, m, ng, z are beneficial for producing partial vibrations. In addition, listening exercises can also be done to develop the perception of clear and bright sounds. Soft and precise entering, sound starts, easy yawning, and smiling (related emotion: looking surprised with widely open, vivid eyes) can also be practiced to improve singing. Various images and imagination may also play a role, for example stringing all the sounds on lace, or imagining, that „if you want to sing in a nice and pleasant voice, your face should be nice and cheerful, too.' Visualizing how a beautiful soprano sings might also be helpful. Listening exercises are also useful in developing the abilities to perceive nice and bright sounds.

Table 3. Characteristics of singing exclusively in the chest register and possibilities for its correction (Asztalos, 2014, 2018) – own research / own editing

SINGING EXCLUSIVELY IN THE CHEST-REGISTER		
	PROBLEMS	CORRECTIONS OF PROBLEMS
Posture	more strained body-posture, high elongated head-posture, protruded chin, mandible, hoisted shoulders	correction of body-posture, correction of head-posture, relaxation of mandible
Breathing	high breathing	midriff activation, deep breathing

SINGING EXCLUSIVELY IN THE CHEST-REGISTER		
	PROBLEMS	CORRECTIONS OF PROBLEMS
Articulation, lips activity	too big mouth opening	articulation exercises singing with a feeling of gape and feeling of a smile
Sound	too loud singing, too low singing, poor high tones, voice cracks in the area of register transition, less elasticity, less flexibility, poor dynamics, less expressive capabilities	„mezza voce", starting from piano, development of singing voice from head-register, glissando excersises, vocal exercises with following vowels: „i", „e", („ü", „ö"), „o", „u" and the most conductive consonants: „n", „m", „ng", „s". softly singing, singing in high register

2.4 Characteristics of singing in thin chirpy voice and the possibilities for its correction

The causes of singing in thin, chirpy voice are as follow: the mouth cavity, as well as the resonance area are less innervated; empty breathing, mouth is barely opened, laziness of the tongue, hearing problems, high breathing, body is understretched. As a result, the sounds are empty, infantile volume is low, occasionally airy; narrow sound range, singing lacks in overtones and sounds rather squeaky; articulation is inadequate and there is no possibility for musical formation. Clearly visible signs include: mouth opening is too small or too wide, negligible air support. The overall impact of the above signs in children is phlegm and deconcentration.

In order to correct singing in thin, chirpy voice physical activity, intensity, vigilance, more intensive breathing (activating the diaphragm), and agility are needed. In order to achieve our aims the air support needs to be elaborated with the help of staccato exercises. (E.g. Imagine, that a small-size man, an elf is jumping up and down in the middle of a trampoline!) It is of utmost importance that children feel the softness of their lips, the vertical opening of their mouths, the space in their mouth cavity, their throat, and yawning). Friendly and cheerful smiles (inner smile), phantasy, emotions, the activation of their childish imagination, and the utilization of tones are also useful. The vowels beneficial for the correction of this error are as follows: u, o, a, ö. In addition, the following consonants are useful to practice: b, d, g, n, m, r. All these sounds need to be sung with vivid articulation and the feeling of spaciousness in the mouth

cavity. Images and phantasies are also helpful when trying to correct the formerly mentioned sound production error. E.g.

- „Act out that you are an opera singer." – affected, unnatural play and speech
- An elf or dwarf is standing on your diaphragm and jumping up and down as if on a trampoline.
- Opening the mouth as if it were a snake – yawning before singing – inner opening!

The following physical exercises are also extremely helpful when trying to correct efficiently children's singing in thin, chirpy voice:

- chewing movement when singing
- looking for inner or outer spaciousness when singing
- dynamic exercises
- large movements with the arms
- exercises with a tennis ball or a gum ball
- singing while standing on one foot

When choosing songs teachers should prefer dynamic pieces with a strong character.

Table 4. Characteristics of singing in thin chirpy voice and the possibilities for its correction (Asztalos, 2014, 2018) – own research / own editing

THIN CHIRPY SINGING VOICE		
	PROBLEMS	CORRECTIONS OF PROBLEMS
posture	sloppy body posture unenthusiastic body posture poor physical discipline	body-posture activation, big hand movements, exercises with tennis ball
breathing	high-breathing, poor breathing support too small breath-movements	breathing intensification, midriff activation staccato exercises
articulation, lips activity	poor articulation, small and too wide mouth-opening	mouth opens softly and vertical feeling of width in mouth and, in throat, gape, inner smile, chewing movements, articulation exercises
sound	too infantile voice, little voice volume sometimes too airy, little singing voice register without overtones	affected singing and playing vocal exercises with following vowels: „u", „o", „a" and the most conductive consonants: „b", „d", „g", „m", „n", „r"; lilt singing with innervate characters

2.5 Characteristics of singing in harsh, 'screeching' voice and the possibilities for its correction

The physical background and cause of singing in harsh, screeching voice is that the gingival veil clings closely to the wall of the pharynx. Due to this feature the mouth cavity resonance is lost and the larynx skids into a high position. The opening of the mouth too widely, too loud, and too low singing, wrong ideas about singing, hearing problems, inadequate resonance of the head and 'high' breathing are all factors that contribute to losing the function of the mouth cavity as a resonator. The sound produced in such a way is too open, sharp, and infantile, frequently showing signs of broken register or intonation problems. The rhythm is frequently cumbersome and singing legato becomes impossible. Furthermore, harmonization is imperfect. Visible signs of this problem include an excessively open mouth, upward position of the head, the jaw pushed forward, and shoulders stiff. Attention! The singing child makes the impression of being active and enthusiastic.

In order to correct the error of singing in a harsh, 'screeching' voice, singing 'forte' needs to be forgotten; all phrases need to be started with "piano". It is also important not to forget about the correctness of the opening of the mouth involving the loose lowering of the lower jaw; in addition, the mouth needs to be opened softly and widely. The shape of the mouth is elongated and narrow. The use of the vowels u, o, ü, ö and of the consonants n, ng, m, s, f is beneficial in the correction of the previously described error. All these sounds need to be sung with relaxed jaw. Attention should be paid to ear training, as well as to the awakening of auditory aesthetics. It is of utmost importance to develop head resonance with the help of buzzing glissando exercises, starting from above. Relaxation exercises are also beneficial as well as the introduction to sloppy articulation.

The use of imagery and imagination can also be helpful in the correction of this type of error. For example:

- 'petting' the sound, making the mouth cavity feel velvety
- snake-like opening of the mouth. Opening it a little; the front teeth are not visible.
- direction of looking: downward
- the sounds come from above, they are light and weightless

When considering the usefulness of physical exercises, the soft movements are preferred. (for example imitating a horizontal 8 with the body movement). Rocking, swinging motions in front of the body are also recommended, while the knees and the hips are flexible. The most efficient training includes the singing of songs of soft, fluid, legato character with small intervals in them.

Table 5. Characteristics of singing in harsh, 'screeching' voice and the possibilities for its correction (Asztalos, 2014, 2018) – own research / own editing

HARSH, 'SCREECHING' VOICE		
	PROBLEMS	CORRECTIONS OF PROBLEMS
POSTURE	upward position of the head, the jaw pushed forward, shoulders stiff	body posture exercises, soft movements, relaxation exercises, rocking, swinging motions in front of the body, the knees and the hips are flexible, imitating a horizontal 8 with the body movement
BREATHING	high breathing	breathing exercises
ARTICULATION, LIPS ACTIVITY	opening of the mouth too widely excessively open mouth the mouth cavity resonance is lost	the loose lowering of the lower jaw, snake-like opening of the mouth, opening it a little; the front teeth are not visible, introduction to sloppy articulation, mouth needs to be opened softly and widely
SOUND	too open, sharp, and infantile sound, too loud, and too low singing, inadequate resonance of the head, showing signs of broken register, intonation problems, the rhythm is frequently cumbersome, singing legato becomes impossible	singing 'forte' needs to be forgotten, all phrases need to be started with "piano", vocal exercises with the following vowels: „u", „o", „ü", "ö" and the most conductive consonants: "n", "ng", "m", "s", "f" ear training, develop head resonance with the help of buzzing, glissando exercises started from above, lilt singing with innervate characters, singing of songs of soft, fluid, legato character with small intervals

2.6 Characteristics of out of tune singing voice and the possibilities for its correction

The term "tone deafness," commonly applied to singing off key, suggests that the cause lies in faulty perception and problems lie in production, memory, and/or sensorimotor integration. Those children are called "out of tune singers" who cannot sing a melody accurately. These children suffer from a lack of functional connections between

hearing (auditory), brain processing, and vocal organ activity. In other words, there is a coordination disorder between hearing and singing. Having interviewed several music teachers in Germany Hermann (quoted by Bruhn, 1993) divided out of tune singers into four groups. According to his survey 5.5 % of out of tune singers sings monotonously, i.e. using one tone throughout 'singing'. In the singing of 20.9 % of them some kind of tune is detectable, but it does not follow that of the song. In 40.6 % of singers the melody contour is more or less identical with that of the song while 33 % sings the song correctly, but in different tonality.

There are three types of out of tune singers: 1. "singing only in speech range" They can "sing" only in their speech range. They can not perceive where the melody moves. They can not perceive either direction of melody or pitch of tones, so they do not know how to sing. They have no experience of how to produce different-pitch of tones with their voice-forming organs. (vocal organs) 2. "false singing" Bigger pitch changes are often perceived as minor changes and are thus reproduced. For example, perfect fifth interval is perceived major second 3. "singing too low" They always sing all too low; they growl (Pfordresher és Brown, 2007).

Some out of tune singers do not know they are singing falsely until someone tells them this.

Coordination of the vocal organ and hearing can be taught to most "poor-pitch singers", but this requires a lot of time, patience, experience and good teaching approaches.

The following exercises can be used successfully in order to correct out of tune singing.

- body contact: the direction of the melody, and the pitch differences must be manually displayed
- eye contact: „sing the tone into my eyes!"
- ear training exercises: high and low
- concentration exercises: give a pause for the thinking before reproducing, singing the given tone (hearing – thinking, perception – singing)
- buzzing exercises: from below and going up (e.g., rockets, lifts, walking uphill and downhill)
- imitation tasks (imitating animal sounds)
- carrying, throwing, and handing over a 'toneball'
- finding the 'common' tone, pitch

A single exercise can be used to address multiple vocal and musical considerations. Exercises may address matters of breath, vocal production, vowel formation, and vocal development. Each exercise used for this particular study is labeled with its fundamental purpose, although many function in several capacities. In two years, all singing problems were remediated. Children's singing development is both varied and

multifaceted, and this has considerable implications for teaching and assessing singing as well as other forms of music-making that depend on singing and the quality of singing during the school years.

Conclusion

The body needs to be balanced for students to project a beautiful singing tone. Breathing exercises teach children to inhale and exhale correctly. Vocal warm-up exercises and vocalizations such as encouraging students to vocalize high and low sounds as well as soft and loud sounds help to develop beautiful singing. A healthy childhood singing voice should be light, smaller than adults' voice, in the nature of the head-register, shiny, sonorous, soaring, floaty, mobile, not veiled nor sophisticated, without pressing, not too loud, soft in the chest register. Well-planned and efficiently executed vocal development activities and exercises are essential for developing good singing habits. Because the vocal cords constitute an extremely sensitive organ, they need special care and training in order to produce healthy singing attributes

If children's voice production problems are corrected not only the quality of their singing will improve, but their intonation will also be better.

3. WARM-UP

The warm-up is a phase prior to the actual beginning of a music lesson, or choir rehearsal; it is made up of a series of teacher-lead tasks and exercises, and, which also includes some stretching and relaxation exercises (Young and Behm, 2002; Bishop 2003, Asztalos, 2018), like breathing, 'buzzing', practicing short descending and ascending scales by singing a variety of syllables and texts. (Hylton, 1995; Collins, 1999; Asztalos, 2018). So, the warm-up part of the lesson mostly features voice production tasks, but the development of singing voice does not come to an end at the end of the warm-up period. The development of singing voice is present throughout the music lesson and the choir rehearsal. The aim of choral warm-up is to create the choir's uniform sound by 'putting together' the individual voices within the choir. (Smith & Sataloff, 2006). Choral conductors need to pay attention to the straight body posture of singers, have singers get used to correct body postures, correct breathing mechanism, correct singing voice production, resonance conditions, and uniform sounding. When developing, doing the various warm-up exercises the healthy singing mechanisms and the uniform sounding of the choir also improve (Ehmann & Haasemann, 1981; Stegman, 2003; Durrant, 2017; Asztalos, 2018; Grad & Cook-Cunningham, 2018). According to Smith & Sataloff (2006) warm-up has three main goals: 1) body alignment and the release of breathing mechanism in order to make singing possible 2) the formation of physical awareness needed for singing 3) 'warm-up' from speech to singing. Specialist literature dealing with classical voice production identifies four types of warm-up exercises: 1) Correction and practice of body posture (Verdolini, 1988; Stegman, 2003; Durrant, 2017; Asztalos, 2018; Grad and Cook-Cunningham, 2018); 2) Breathing exercises to practice correct breathing (Watson and Hixon, 1985; Ringel et al, 1987; Boone, 1988; Sataloff, 1998; Stegman, 2003; Durrant, 2017; Asztalos, 2018b; Grad and Cook-Cunningham, 2018) 3) Vocal exercises (Verdolini, 1988; Stemple et al, 1994; Stegman, 2003; Durrant, 2017; Asztalos, 2018; Grad and Cook-Cunningham, 2018); 4) Articulatory exercises (Mendes et al, 2003; Stegman, 2003; Durrant, 2017; Asztalos, 2018; Grad and Cook-Cunningham, 2018). Planning the warm-up would be a very important task for all choral conductors because with a good warm-up they could nurture children's healthy voice production and together with it they could improve the way their choir sounds. (Stegman, 2003; Olesen, 2010; Durrant, 2017). The choral conductors' training and work background as well as his views, beliefs and teaching style have an effect on the success and efficiency of warm-ups. (Olesen, 2010; Durrant, 2017).

Warm-ups play an important role not only in choir rehearsals, but also in the introductory phase of music lessons. This part of the lessons regularly has to be present in

every lesson and it needs to be organized in a conscious and expertly way. If breathing, the larynx (starting the sound), the resonance conditions as well as the phonetic phenomena of vocal music are in unison and operate correctly, they are aligned to the children's age, meaning that the singing voice will sound in its full beauty.

3.1. Exercises for the correction of body posture

Exercise 1.
Relaxation exercises on the floor (awakening of body consciousness).

Exercise 2
Bend down with stretched legs and touch the floor with your palms. Look like a mountain!

Exercise 3
Imitation of a morning stretch. Try to reach the stars.

Exercise 4
Apple picking: Stretch and reach for the top apples on a tree. Pick one and put it into the basket on the floor. This exercise is aimed at stretching the muscles.

Exercise 5
Stair climbing: the lift is out of order, so we have to climb the stairs onto the 5th floor. Imitate stair climbing. This exercise is aimed at widening children's intercostal muscles.

Exercise 6
The imitation of climbing up a ladder.

Exercise 7
The imitation of snowballing. This exercise is aimed at widening children's intercostal muscles.

Exercise 8
Knees and hands are opposite to each other. (kinesiology).

Exercise 9
Slight tapping of the meridians

Exercise 10
Imitation of walking uphill/downhill performed with sound imitation in a variety of pitches (glissando).

Exercise 11
Doubles exercise: children rub their backs together, like a bear rubs its back to a tree.

Exercise 12
The imitation of various types of sport using a variety of tempos (fast and slow) including swimming, badminton, tennis, aerobics, skiing etc.

Exercise 13
Imitation of the way models walk

Exercise 14
Imitation of basic movements like walking, hurrying, pulling, running etc.

Exercise 15
Imitation of the way certain animals move, including rabbits, cats, snakes, elephants etc.

Exercise 16
Pantomime.

Exercise 17
Shoulder and arms circling forward and backward, shoulder raising.

Exercise 18t
Relaxing the neck – head circling, nodding yes-no.

Exercise 19
Shaking exercises from head to toe.

Exercise 20
Massaging and gently tapping each other.

Exercise 21
Imitation of horseback riding.

Exercise 22
Imitation of marionette figures: the way they move around and straighten up.

Exercise 23
Imitation of the way trees sway in wind.

Exercise 24
Tiptoeing, walking on heels, then on the inner and outer side of the foot.

Exercise 25
Bending down then straightening from vertebra to vertebra.

Exercise 26
Imitating painting with the hand and with the arm.

Exercise 27
Imitation of your mirror-image (doubles play).

Exercise 28
Standing on one foot. Balancing exercises.

In order to reconstruct appropriate body posture and to practice correct breathing the Alexander-technique can be recommended for each age group, beginning from early childhood. The Alexander-technique has been used for over one hundred years to lay the foundation for the singing profession and for improving and perfecting singing abilities. When defining singing Rodd-Marling said that the mechanism of breathing and singing is kept alive and active by the desire to express ourselves. There are other areas in life where we want to express ourselves: we tense our muscles, do everything we can to achieve the most. It is not beneficial in every situation in life, because we tighten most of our muscles at the same time and do not preserve the original muscle tone, which would make some openings possible. The free movement of the neck, its tension-free state are all essential criteria for singing. Considering the fact that our body functions as a single whole, it is important to remember too, that the way how different parts of the body work also influence one another.

The Alexander-technique teaches:

- how to use our spinal cord in its full length (instead of the usual curvature position)
- how to open the chest
- how to get rid of unnecessary tension

- how to control the movements and how to feel the optimal way the body functions as a system.

Without the desire to express ourselves the voice production organs cannot function in unison with other organs of the body as a system. If someone wants to sing in this situation his attention is primarily focused on his throat and thus singing becomes 'artificial'.

Which voice production organ can make wonders in the world of music?

In abstract wording this is the body part from head to toe with the lungs and the larynx. True, there are several minor body parts as well, but all of them need to be vigilant and active before the 'whole' begins to function. (Macdonald & Ness, 2007).

3.2 Breathing exercises

The so-called 'high' breathing (shoulder breathing) is a common problem with children. Its signs are clearly visible and audible during inhalation: the shoulders are raised high and there is a whistling sound. This kind of high breathing = shoulder breathing is problematic because it is the pectoral and intercostal muscles that work, and the diaphragm does not have a role. As a result, the children run out of air, despite the fact that they took a deep breath. The muscles get stiff, the neck and throat cramp. There are signs sent to the brain that the children have a choking sensation. This state generates hurried inhalation, due to which it becomes impossible to produce natural and light sounds and sing. This is why it is of utmost importance to correct children's body posture and teach them deep breathing.

1) exercises, beneficial for the acquisition of deep breathing
2) exercising beneficial for the activation of the diaphragm.

1) Exercises beneficial for deep breathing:

Exercise 1

Inhale and show surprise. Be surprised, for example, as if seeing a fabulous cake, a beautiful bunch of flowers, or a nice sunny panoramic view, etc. But, be careful, you do not hold your breath, but, instead, you show surprise uninterruptedly. At the same time children are asked to put their hands on their swinging rib and feel that it moves sideways during inhalation while their shoulders remain in their original position.

Exercise 2
Our lungs are like barrels to be filled with air similarly to the way how barrels are filled up with water. It means that first the bottom of the barrel is filled up with water./air. At the same time children are asked to put their hands on their swinging rib and feel that it moves sideways during inhalation while their shoulders remain in their original position.

Exercise 3
Imagine, that there is a closed umbrella inside us, between our waist and neck. When inhaling it gradually opens. It means that our waistband grows in all directions.

Exercise 4
Imagine that during inhalation a rubber ring is growing around our waist.

Exercise 5
Imagine inhaling deeply the scent of a beautiful bunch of flowers. In the meantime the back wall of the pharynx, the chest and the area around the sacrum increase, and the scent passes through the whole body.

Exercise 6
Bend down slowly, rolling from vertebra to vertebra and touch the ankles; then inhale and concentrate on the location where the air goes. Then stand up and let the air in again.

Exercise 7
Inhale, possibly through the nose avoiding 'high breathing' and raising the shoulder. Next an exhalation follows accompanied by sounding a soft consonant, for example „sz", „s" or „f" as long as you run out of air. Pay attention to your throat. The exercise is done correctly, if there is no tension in you.

Exercise 8
Exhale by letting out light bubbles evenly. Imagine that:
- the wind is blowing the trees – *fffff* (in the meantime children use their arms as well as their bodies to illustrate the strengthening or the weakening of the wind.)
- you blow very carefully and slowly the hot soup in your spoon. Be careful: the soup should not flow out of your spoon.

Exercise 9
Intense breathing: cover one of your nostrils and inhale though the other one, deeply and slowly. Then, exhale through your mouth and repeat the exercise by covering the other nostril, but for exhalation you use your mouth again. .

It is very important for children to avoid 'high breathing', shoulder breathing, or whistling breathing. Their shoulders should not be raised either. The air is supposed to go in silently and deep, and, their waistband, around the swinging rib, should expand. It also helps a lot, if, at the same time, children use their imagination, too.

2) Diaphragm-activating exercises:

Breathing is primarily regulated by the diaphragm. It is only the correct and natural diaphragm breathing that can sprovide the right support in sound production. This is why awareness of the correct diaphragm movements is of primary importance in singing. If children put their hands on their bellies then they will perceive the upward and downward movement of the diaphragm. Children should follow the movement of their diaphragms all the time when singing. This is how correct breathing automates after a while. As a cellist catches the strings to play a tune, singing children are to control their breathing by checking their diaphragm movements.

Exercise 1
Imagine that the diaphragm is a trampoline and imagine the sound a dwarf is producing when jumping on it. (Teachers must show their pupils where their diaphragm is).

Exercise 2
Scare the child next to you and pay attention to your diaphragm movements.

Exercise 3
Exhale the air briefly. At the same time imagine that

- you abruptly blow the dust off the desk (or another piece of furniture) briefly, with minimal air.
- you abruptly blow off a light feather from your hand with minimal air.
- you hold a dandelion in your hand and blow off its petals abruptly, with minimal air.

Exercise 4
Inhale slowly through a straw and then exhale slowly through the straw.

Exercise 5
Exhale several times as if the air would come out through the valve of a bicycle wheel.

Exercise 6
Imagine that you have to hush a big noisy crowd.

Exercise 7
Imitate an old steam locomotive by uttering „s" sounds. Begin slowly, then speed up gradually, then slow down again.

Exercise 8
Imitate a steam locomotive nearing then moving away. As it is nearing us, it becomes louder and louder (crescendo), then, when moving away, it becomes quiter and quieter (decrescendo).

Exercise 9
Imitate a panting dog. In the meantime, the chest is supposed to be motionless.

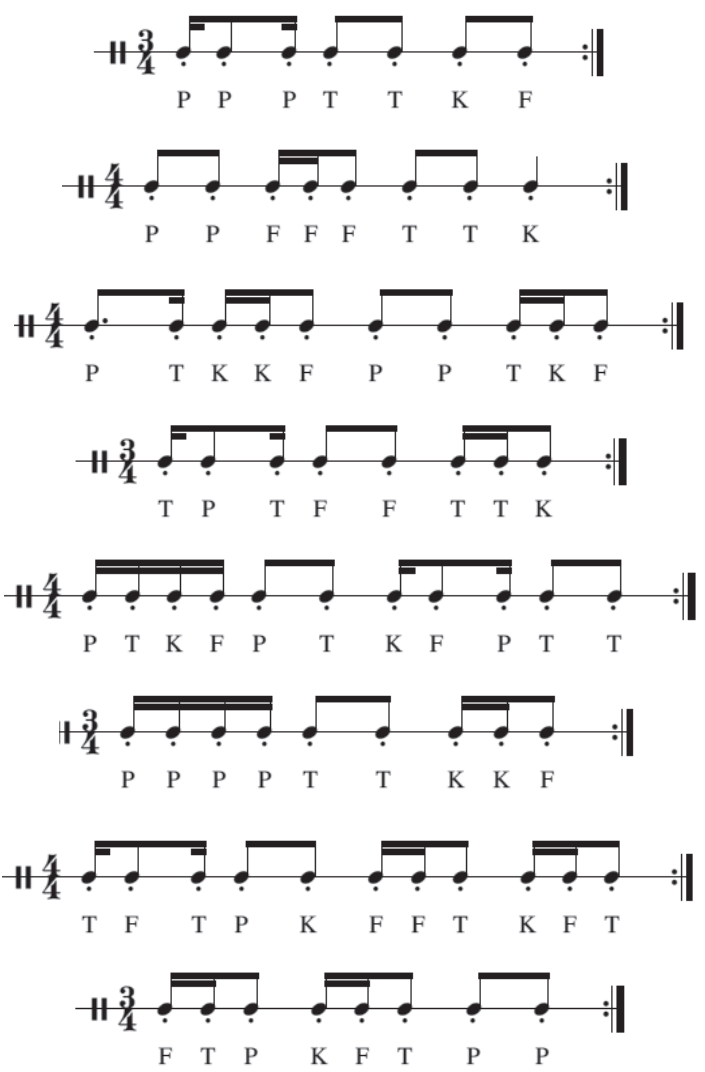
Exercise 10
Imagine various noises coming from nature. Imitate

- the soft evening breeze with „f" sounds (piano), then stronger and stronger winds which eventually calms down. In this case „s" sounds are used (crescendo – decrescendo)!
- a severe storm with the „s" sound (forte or fortissimo).
- a swarm of bees approaching then moving away. Use „z" sounds. (mezzoforte – crescendo – decrescendo)

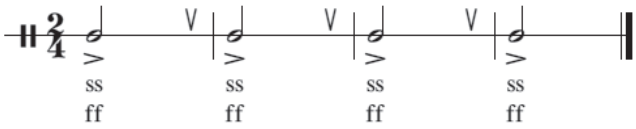
Exercise 11

Pronounce consonants silently. The movement of the diaphragm is checked by the children using their hands. Begin slowly, then they speed up, and eventually, slow down again.

When performing similar tasks, the order and the rhythm of the consonants P, T, K, and F can be varied freely. Some examples follow in which the teachers are free to identify the number of repetitions as well as the extent of speeding or slowing, and loudness.

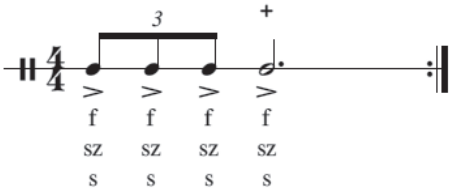


Exercise 12



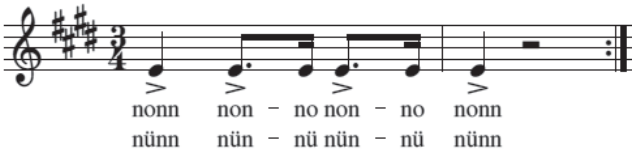
At the end of the beats at the „V" sign the air is exhaled and relax. Pay attention to the diaphragm: impulses should come from there instead of the larynx.

Exercise 13



At the sign „+" exhale the air gradually and pay attention to the diaphragm.

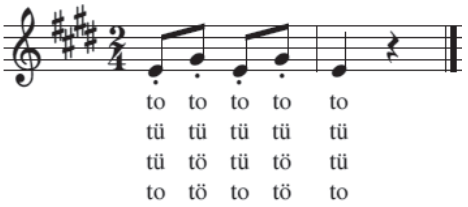
Exercise 14



At the sign „>" the diaphragm 'jumps'. This task needs to be repeated beginning with a sound a second higher until the 'h' initial sound.

This task can be varied by using the following pairs of syllables: bomm-bommo, bümm-bümmü, bimm-bimmi, bömm-bömmö, dumm-dumma.

Exercise 15



This task can be performed by paring up and varying the following syllables: pü, pö, pu, pá, pi, pé, pü-pö, pu-po, pi-pé, bi, bö, bü, bu-bo

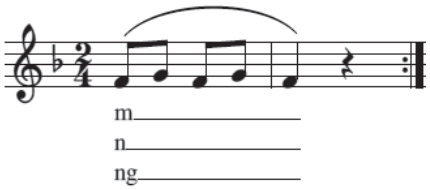
3.3 „Buzzing" exercises (resonance development)

All the tasks within the framework of this chapter are to begin with the highest sound written down in the score then the task is to be repeated from a second higher (in the meantime the individual syllables or the pairs of syllables can be changed) within the given – e" - d" sound range. Below the music score there is a list of sounds, syllables and pairs of syllables, which, when performing this task, are recommended to sing. Practicing with „ng" means 'buzzing' with open mouth.

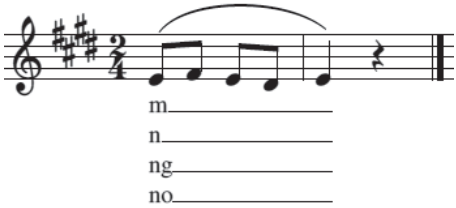
Exercise 1 – „buzzing" exercise (without exact pitch)

- imitating the taste of delicious food in the mouth (Mm)
- imitating the sound of a bee

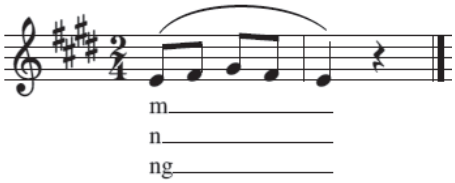
Exercise 2. – „buzzing" exercise



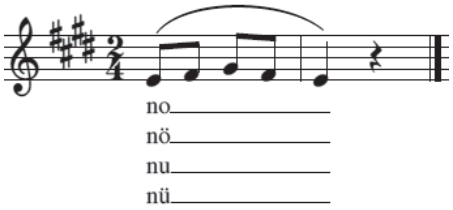
Exercise 3. – „buzzing" exercise



Exercise 4 – „buzzing" exercise

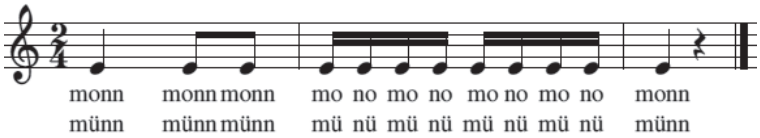


Exercise 5 – „buzzing" exercise



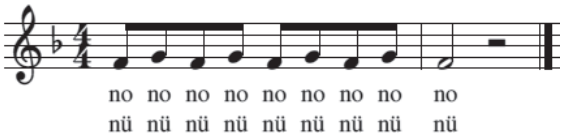
Additional syllables: mo, mö, mu, mü, mi, mé, má, ni, né

Exercise 6



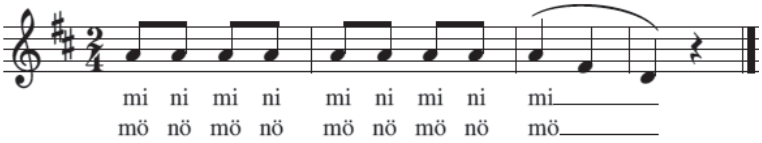
Additional syllable pairs: mönn-mönö, munn-munu, minn-mini, ménn-méné, mánn-máná

Exercise 7



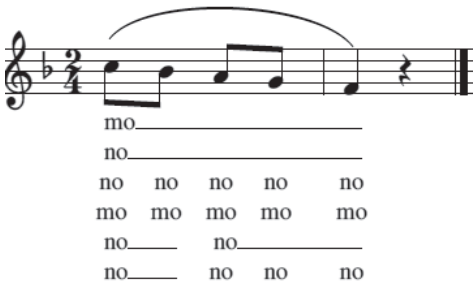
Additional syllables: nö, nu, ni, né, ná, zo, zö, zu, zü, zi, zé, zá, vo, vö, vu, vü, vi, vé, vá

Exercise 8



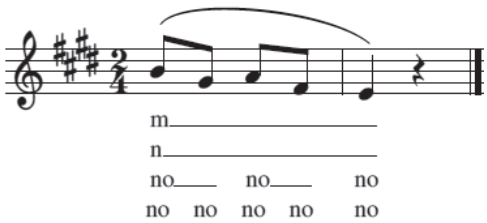
Additional syllable pairs: mo-no, mu-nu, mü-nü, mi-ni, mé-né, má-ná

Exercise 9



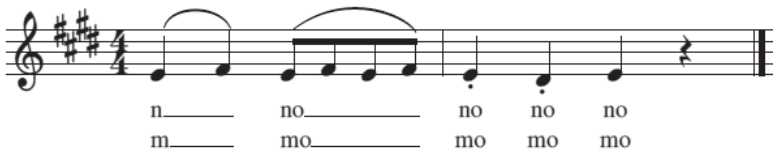
Additional syllables: mö, nö, mü, nü, mi, ni, mé, né, má, ná, zo, zö, zu, zü, zi, zé, zá, vo, vö, vü, vu, vi, vé, ve

Exercise 10



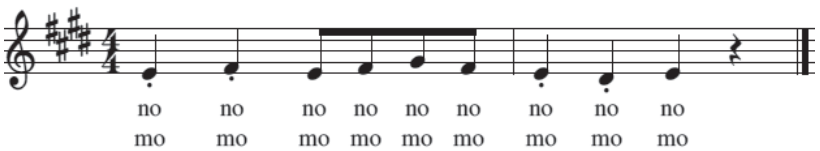
Additional syllables: mö, nö, mü, nü, mi, ni, né, mé, má, ná, zo, zö, zu, zü, zi, zé, zá, vo, vö, vü, vu, vi, vé, ve

Exercise 11



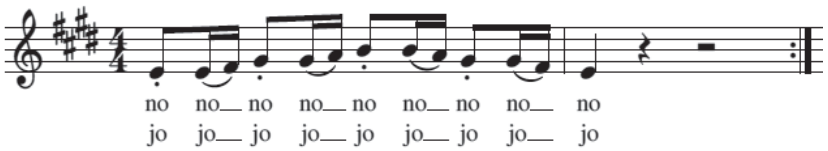
Additional syllables: m-mö, m-mü, m-mu, m-mi, m-mé, m-má, n-nö, n-nü, n-nu, n-ni

Exercise 12



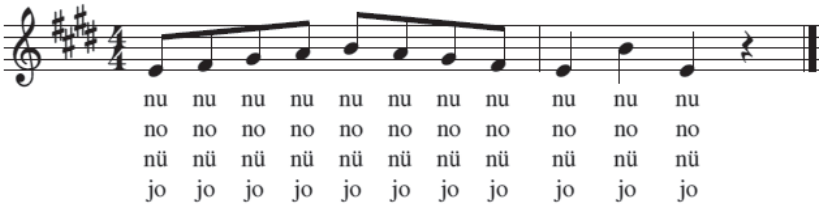
Additional syllables, syllable pairs: nö, nu, nü, ni, mö, mü, mu, trá-lá, fá-lá, jo, lá, lü, li.

Exercise 13



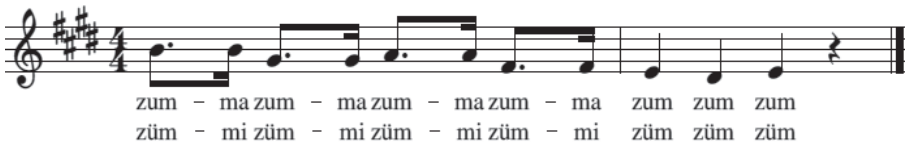
Additional syllables, syllable pairs: trá-lá, fá-lá, jo, lá, lü, li.

Exercise 14



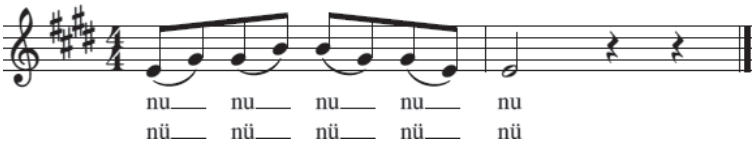
Additional syllables, syllable pairs: lo, lá, jö, jü, no-lo, vo-lo, vi-li

Exercise 15



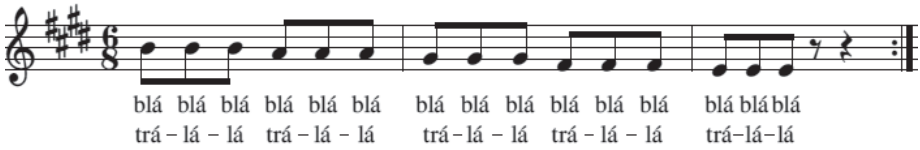
Additional syllable pairs: brum-ma, tra-la

Exercise 16



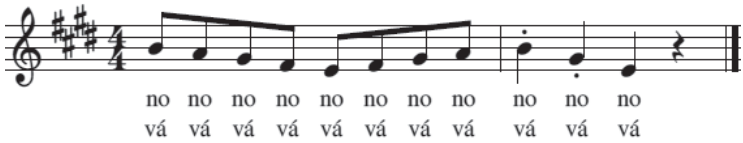
Additional syllables: nü, nö, nu, mo, mö, mü, mu, ni, jó, zo, zö,

Exercise 17



Additional syllable pairs: fá-lá-lá

Exercise 18

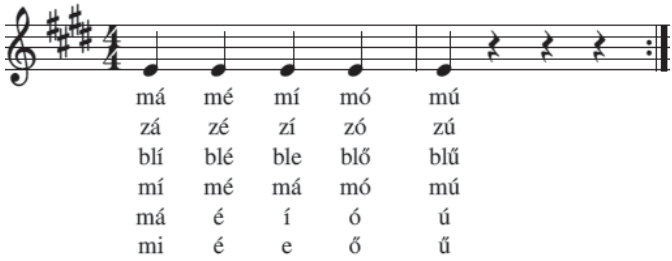


Additional syllables: zo, zö, zü, zu, zi, vo, vö, lá, lo, lö, li

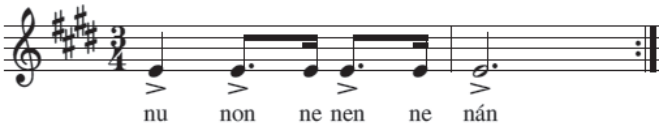
3.4 Articulatory exercises for the development of resonance

This chapter includes practical tasks and exercises which help to produce uniform sounds and to correct the lip movement

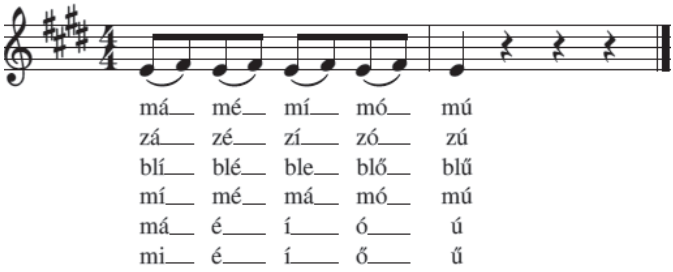
Exercise 1



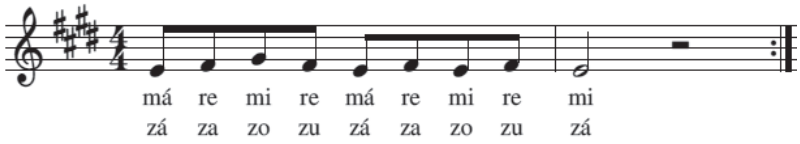
Exercise 2



Exercise 3

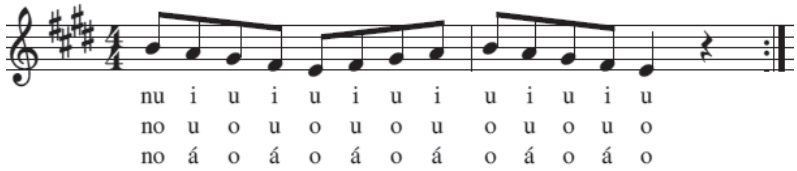


Exercise 4



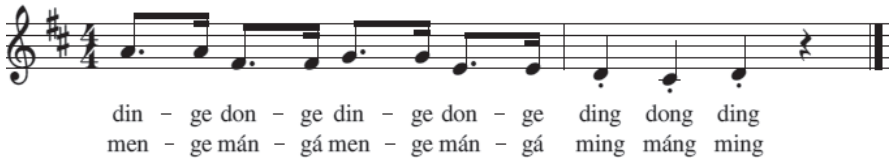
Additional syllable pairs: ná-na-no-nu, vá-va-vo-vu

Exercise 5

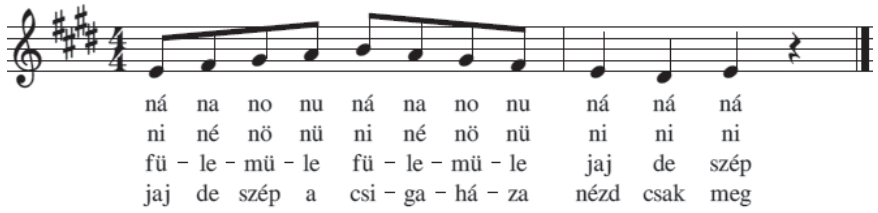


Additional syllable pairs: mo-i-o-i, mo-ö-o-ö, mi-é-i-é, mo-á-o-á, vá-ve-vi-vo, mö-mö-mö-mö, nu-nu-nu-nu, lo-lo-lo-lo, tu-i-u-i, tu-i-tu-i.

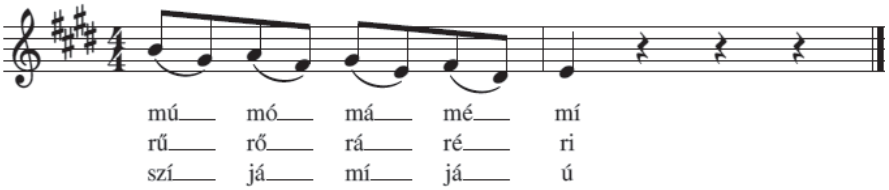
Exercise 6



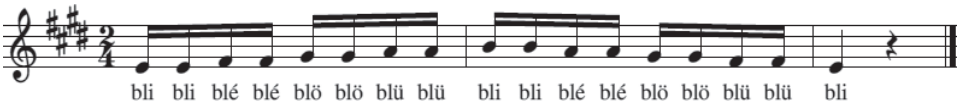
Exercise 7



Exercise 8

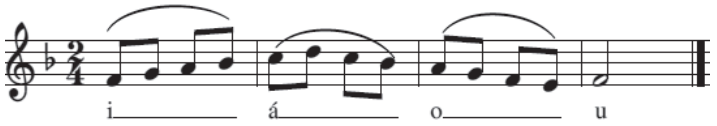


Exercise 9

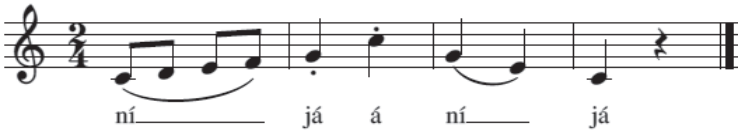


3.5 Tasks for the expansion of vocal range

Exercise 1

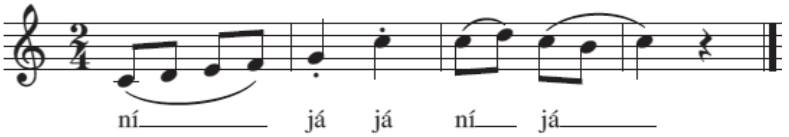


Exercise 2



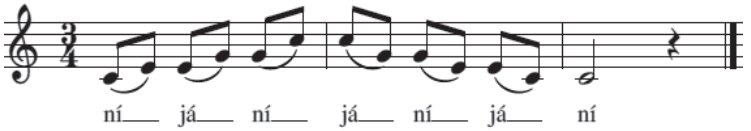
Additional syllable pairs: mé-jo, mí-jo, mí-já, zű-jó, zű-já, zí-jo, zí-já.

Exercise 3



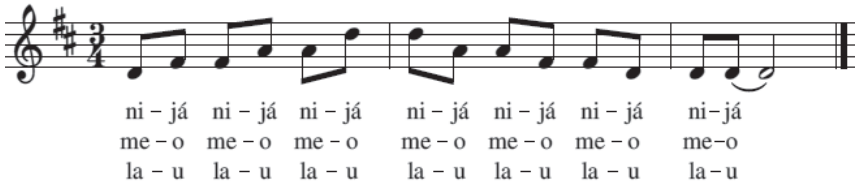
Additional syllable pairs: zi-jo, zü-jo, tril-lá, mi-já, zi-já,

Exercise 4



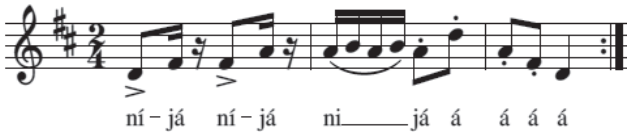
Additional syllable pairs: ní-jó, zí-jó, zű-jó, mí-já, mí-jó, szí-já, szí-jó.

Exercise 5



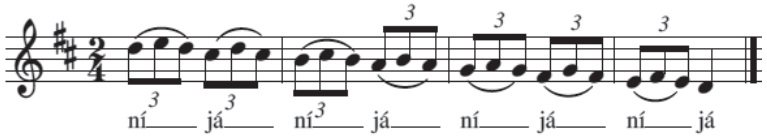
Additional syllable pairs: ní-jó, zí-jó, zű-jó, mí-já, mí-jó, szí-já, szí-jó.

Exercise 6



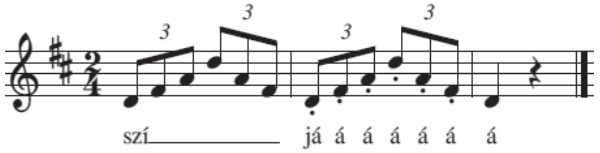
Additional syllable pairs: ní-jo, zí-jo, zű-jo, mí-já, mí-jo, szí-já, szí-jo, ví-jó, ví-já.

Exercise 7



Additional syllable pairs: ní-jó, zí-jó, zű-jó, mí-já, mí-jó, szí-já, szí-jó, ví-vó, vi-vé, ví-vá, zí-zű, zí-zé.

Exercise 8



Additional syllable pairs: ní-jo, zí-jo, zű-jo, mí-já, mí-jo, szí-jo, ví-jo, ví-já.

3.6 Tasks for the development of musical expression

The tasks which serve to develop musical expression may be linked up with the former exercises, for example, children may use different tone. They may sing happily, sadly, fiercely, or in a begging tone. These exercises also demonstrate a variety in dynamism, stress, or tempo – crescendo, decrescendo; singers speed up and then slow down. It is also possible to include a short song with lyrics. It is also useful at this stage if the teacher acts as a conductor.

4. EXAMPLES OF WARM-UP EXERCISES

4.1 Warm-up 'stories' for kindergarteners and lower primary school pupils

When planning warm-up activities for young children, teachers always have to come up with a theme, a 'motto', for example spring, carnival, animals etc. and this theme needs to be embedded in a story or a tale. It is also useful to include physical movements as well. The tunes are sung by the teacher several times in bright and glittering sound, but, when it is the children's turn to repeat, teachers are not recommended to sing with them. Loud singing is not recommended either; we should aim at singing in light and soft voice, „mezza voce" instead.

In the sound production of lower primary school children, teachers have to pay attention to the following factors:

- straightening body posture
- relaxation and activation of the body
- deep breathing – activation of the diaphragm
- laxity of the lower jaw when opening the mouth
- soft and precise sound start
- head resonance
- opening up of the inner space (surprise, yawn + smile)
- articulation, speech, tones
- expression, emotion, entertainment

Example 1

Lili, the witch (a warm-up 'tale') – Act it out.

Little Lili, the witch lives in a small house with her parents. It is night out there and Lili is asleep. ***Inhale and fffffffff exhale.*** This is a very special night. There is full moon out there and there is so much light that Lili cannot sleep. ***She gets up and stretches.***

Then, she has a wonderful idea.„Now, that I am awake and everybody else is asleep, I'll take my secret broom and fly around a little bit."

She takes her broom and opens the window: ***She stretches toward the window and opens it.***

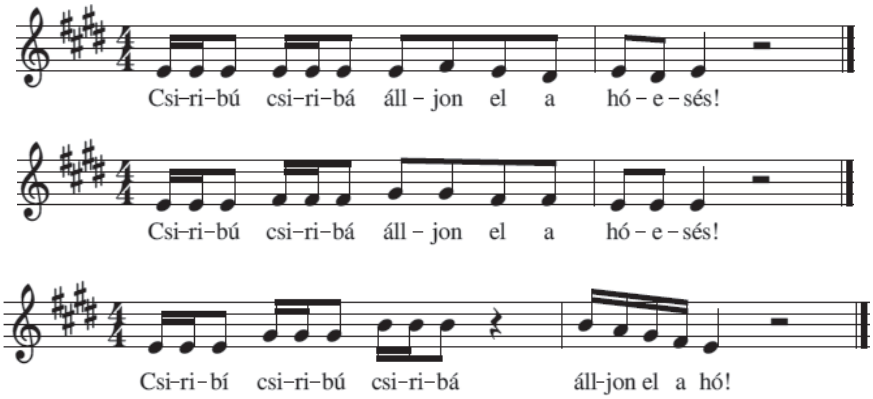
Lili sits on the broom and flies away. ***huuuuiiiiii (upward glissando)***

She is enjoying her beautiful flight. But then she realizes that it has started to snow. There are many snowflakes landing one by one on her head and arms. ***p p p p p p***

Lili looks around and notices how nice the view is. ***óóóóóóóó (astonishment and wavy glissando)***

After some time Lili is cold and she wants to warm up her hands. ***She blows soft warm air onto her hands several times.***

After a time Lili has the idea to stop snowing with her magic.

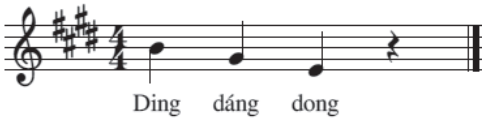


And really, it did stop snowing. ***Lili sweeps the snow off from her arms and legs.***

It is dawning and then it is already morning.

Some birds also wake up and Lili listens to their songs:. ***pi pi pi pi pi pi (on h' then c")0***

Lili is happy to hear the birds chirp. ***(Imitate the chirping birds.)***



Then Lili hears the morning bells.

She suddenly remembers that her parents would wake up soon.

She has to hurry and fly back because she does not want her parents to know about her night adventure.

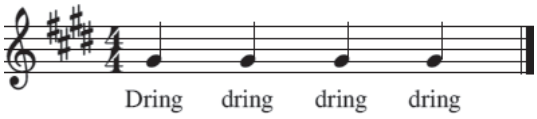
So, Lili the little witch flies back home and she lands slowly on the window pane: ***húúúúúúúú (slowly descending glissando)***

Then Lili goes back into her bed and waits to be woken up by her mother.

Example 2

A Trip to New York (a warm-up 'tale') – Act it out.

We are sound asleep and then, all of a sudden, our alarm clock begins to ring.



We get up, stretch, then open the window and let the fresh air in: ***Inhale and exhale deeply.***

So as to wake up completely we take a quick shower: ***ps-ps-ps-ps-ps-ps-ps (imitate the sound of the shower.)***

It is very cold! ***Brrrrrrrrrr***

Then we turn off the tap, open the shower cabin, dry ourselves, and get dressed.

We are ready now to leave for New York.

We go down the stairs and there is a taxi waiting for us in front of the house. We will take this taxi to the airport. We put our luggage into the trunk of the car, we get in and leave. ***Bbbbbbbbbb (speeding up. slowing down. Imitating a taxi drive)***

We get out of the car, take the luggage from the trunk and walk to the nearest check-in counter. Then we get on the plane and it takes off. ***zzzzzzzz (ascending glissando)***

Many hours pass and, at last, we arrive in New York. Our plane lands. ***zzzzzzzzzz (descending)***

New York's streets are very noisy. An ambulance dashes past us: ***nuiuiui (waving glissando)***

First we go on sightseeing. We take the elevator and go up to the top of the Empire State Building (a giant tower): ***vuuuuuuuu (ascending glissando)***

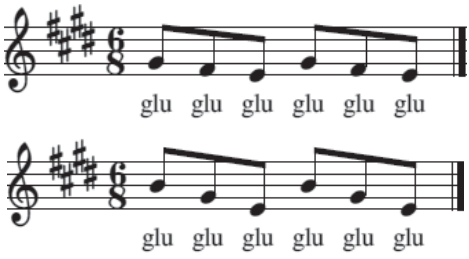
The view is extremely beautiful from here. ***óóóóóóóóó (surprise)***

Then take the elevator again and go down. ***vuuuuuuuu (descending glissando)***

Of course we are very hungry after this adventure. We have an icecream. First let's try the strawberry flavour. ***Mmmmm***, very tasty!

We are still hungry so we buy another ice cream. It is chocolate flavour. ***Mmmmm***, it is very tasty, too!

Then we drink a coke because it is a hot day. ***glu-glu-glu-glu***



Now let us go to the huge Central Park and have a stroll there.

All of a sudden we can hear a dog's loud bark behind us: ***vau-vau-vau-vau-vau beginning from e' and f)***

We turn back and see that a huge dog is running toward us.

So, we decide to run away as fast as we can until the dog is nowhere to be seen. Then we stop because we are very tired: ***Imitate running in place then pant a little.***

We are tired so we go back to the hotel. We use the elevator to go to our rooms: ***vuuuuuuu (ascending glissando)***

We are exhausted when we go to bed.

Further tips to create warm-up tales for children:

- hiking in the forest where they can meet various small and big animals. They can imitate the animals' sounds. (e.g. ber cub, mother bear etc.). In the meantime, they can also experience stormy weather (imitation of natural phenomena, e.g. wind, thunder, rain tec.)
- a walk in the zoo (imitation of animals' sounds with exercises featuring narrow sound range. Children are supposed to tell the difference between the sounds of young and adult animals, too)
- touring the jungle morning routine at home and going to school etc.

4.2 Warm-up exercises for 10–14-year-old children

Sometime needs to be allocated at the beginning of each music lesson for warm-up exercises when working with children aged 10-14. It usually takes 5 minutes to use these exercises for the development of their singing voice production.

The structure of warm-up periods is as follows:

1. Relaxation exercises in order to correct body posture. (Relaxation followed by the activation of the body; straightening of the body.) This phase comprises 4-5 brief exercises
2. Breathing exercises (the formation of reflective breathing, deep breathing, the right air supply, the activation of the diaphragm). It is also possible to combine breathing exercises with those ones which serve both the correction of body posture and sound production. This phase comprises 2-3 brief exercises.
3. Voice warm-up – with sounds of narrow range („buzzing" exercises, head resonance, the opening of the mouth, the activation of the diaphragm with staccatos, vowels, consonants, articulation tasks.)
    a. „buzzing' and voiced exercises (2-3 brief tasks)
    b. articulatory, resonance development exercises (formation of uniform vowels, precise formation of consonants, agile text delivery) (2-3 brief exercises)
4. Expansion of sound range – general sound production tasks (fluency, high / low, jumps, polyphony) – 1-2 exercises
5. Exercises to develop musical expression (tones, emotions, dynamics, speech) – 1 exercise.

When planning warm-up tasks, the following points need to be considered:

- if possible, the first step is always the correction of body posture
- next breathing exercises follow (together with listening and concentration exercises)
- voice warm-up begins with exercises representing middle lage (between e'-d"), they represent a narrow sound range, and from second sound range children will gradually get to quint. If possible, exercises begin both high and low.
- exercises should represent staccato
- exercises designed to expand sound range should represent an octave
- it is important to focus on ideal tonality when practicing
- all exercises should be funny and entertaining

It is also important to consider the following ideas:

- the volume of warm-up tasks should not exceed mezzoforte
- when demonstrating the task, the teacher is supposed to use bright and glittering sounds
- children always need to sing easily and softly
- The teacher is to sing beautifully when demonstrating the task, but she is not supposed to sing together with the children. If they do, they cannot concentrate on errors and will not be able to correct them.
- Teachers should always be positive when correcting children's singing.

Warm-up 1 (Sample)

Exercises to correct body posture:

1. Imitation of stretching. Stretch and try to reach the stars.
2. Circle shoulders and arms. Forward then backward.
3. Shaking of arms and legs.
4. Tiptoeing, walking on the heel, or, on the outer or inner side of the sole.
5. Imitation of the walking and stretching of a marionette puppet.

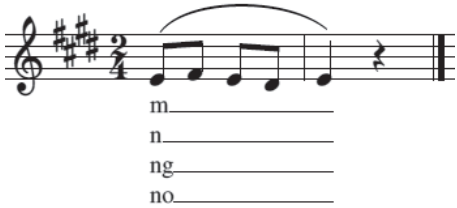
Breathing exercises:

1. Inhalation with a feeling of surprise. When inhale, admire for example a beautiful cake, a nice bunch of flowers or a beautiful sunny landscape. But be careful! Do not hold your breath, but your admiration lasts long. In the meantime, children are supposed to put their hands of their swinging rib and feel that it moves sideways when inhaling and also they should keep their shoulders in place.

2. Imitate an old steam locomotive with an „s" sound. Begin slowly, then speed up, then slow down again.
3. Exercise to activate the diaphragm. Pronounce the consonants silently. Check with your hands how your diaphragm moves. Begin slowly, then speed up, then slow down again.

„Buzzing" exercises

1. „Buzzing" exercises



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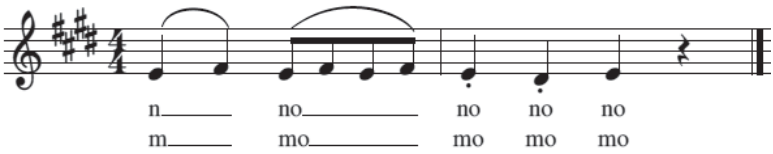
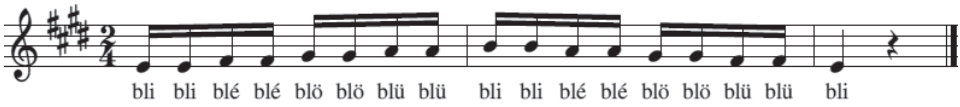


Additional syllables: m-mö, m-mü, m-mu, m-mi, m-mé, m-má, n-nö, n-nü, n-nu, n-ni

Articulatory exercises for the development of resonance

1.



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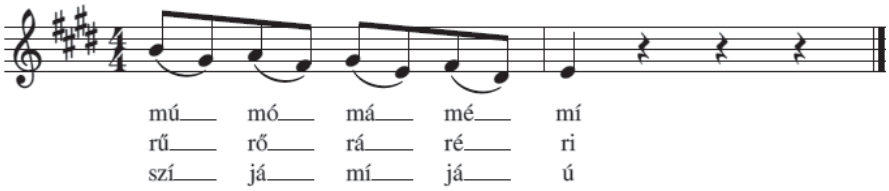
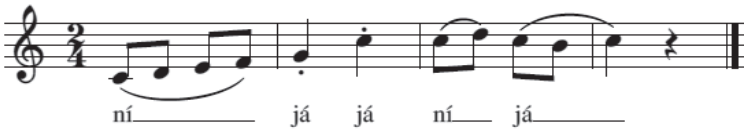
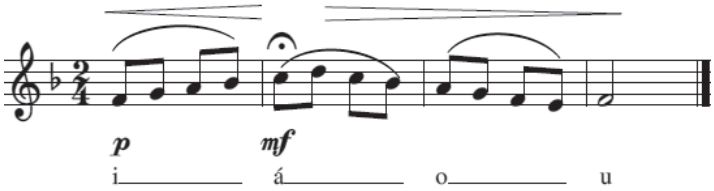


Task for the expansion of vocal range



Task for the development of musical expression



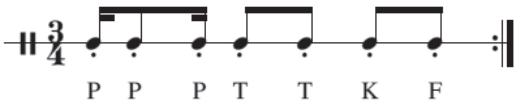
Warm-up 2 (Sample)

Exercises to correct body posture:

1. Apple picking: Stretch so as to reach the apple on the top branches of the tree. Then pick it and put it into the basket on the ground. The aim of this exercise is to stretch the muscles.
2. Circling with the head.
3. Facial massage.
4. Trunk bending and circling
5. Tapping hands and legs softly, then shaking them

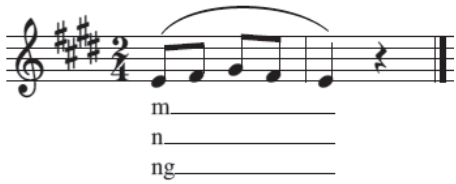
Breathing exercises:

1. Inhale and, in the meantime imagine that a rubber ring is growing on your belly.
2. Imagine that a huge and noisy crowd needs to be silenced with a „pssst".
3. Exercise to activate the diaphragm. Consonants have to be pronounced silently. Check with your hands the movement of the diaphragm. Begin slowly, speed up, then, gradually, slow down again.



„Buzzing" exercises

1. „Buzzing" exercises



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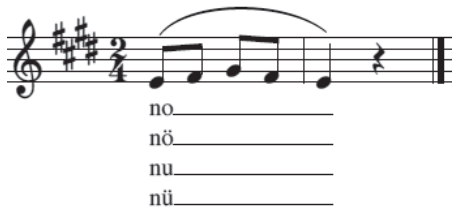

Additional syllables: mo, mö, mu, mü, mi, mé, má, ni, né

Articulatory exercises for the development of resonance

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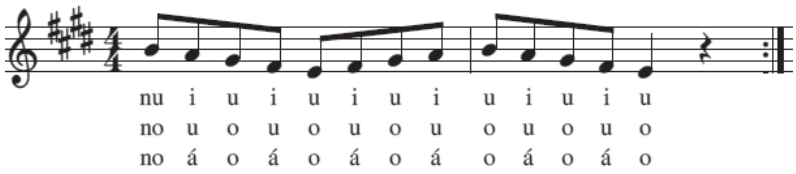

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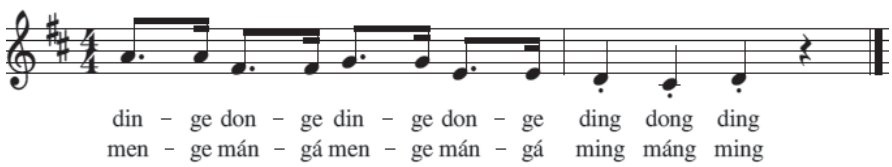
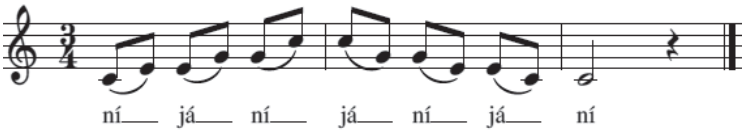
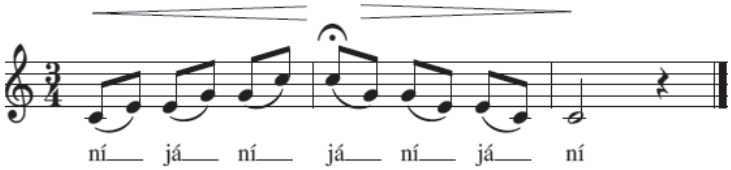


Task for the expansion of vocal range



Task for the development of musical expression



5. VOICE MUTATION

A voice change, or voice mutation is the transformation of children's voice into adult voice in the period of puberty, i.e. sexual maturation. Due to the specific changes typical in the period of puberty boys' voices undergo a significant change (mutation). It is caused by the extremely rapid development of their larynx. Girls' voice also changes, but it is less noticeable. Mutation is a physiological phenomenon induced by hormones. In case of girls this change occurs at the age of 10-14 and it lasts about six months, while in case old boys it is usually experienced when they are 11-16 years old, and this period can be as long as two years (Hirschberg et al, 2013). Mutation has three phases:

1. Pre-mutation is the period preceding mutation: 9-12 years of age. It can be characterized by coarseness of voice and the gradual loss of higher notes.
2. Mutation is the period from 11-16 years of age. This is the most critical period in voice development with the most dramatic changes.
3. Post-mutation is the period from 16-18 years of age. This phase can last as long as 2-3 years. It comes to an end when the final sound position and sound quality is stabilized.

It is during the three phases of the period of mutation that the larynx grows in size: the shield cartilage in boys changes considerably, both vertically and also in its anteroposterior position. This growth is mostly vertical in girls (Kahane, 1982). Considering voice production the most significant change at the age of puberty is the lengthening of vocal cords: in boys it is one cm, while in girls it is only 3-4 mm. Thus the total length of vocal cords in men is about 16 mm (bass), while in women the average is about 10 mm. The tissue of vocal cords reaches its adult structure at around the age of 16 (Hirschberg et al, 2013).

The lower limit of voice range in boys becomes suddenly and remarkably low, while the higher limit changes more slowly. The higher voice range loses its dynamism: the register transition becomes a 'register jump', and in the range higher than the chest register only a quiet falsetto (artificial) sound can be produced. The voice is often coarse, veiled or broken. Occasionally, during laryngoscopy, it becomes evident that the vocal cords are hyperaemic and veined (Hirschberg et al, 2013). As the volume of the chest and lungs grows the quantity of air available for voice production also increases. The resonator cavity grows in its volume and this fact will influence the tone. Voice performance decreases during puberty; this is why vocal overstressing, especially when singing, is not recommended. (Hirschberg et al, 2013).

During mutation it is advisable to give up singing and thus make it possible for the body to develop unforcibly and healthily. When the period of mutation comes to an end a lot of expertly care and patience is needed to assist the young with their smooth return to sound training and singing. (Hirschberg, Hacki, Mészáros, 2013; Surján and Frint 1982).

Nowadays it has become acceptable to let sing gently, lightly, and softly during the three periods of mutation as well, while in the past it was forbidden to use the singing voice during the entire period of mutation. Currently it is thought that it is only the period of acute mutation (2nd phase) that singing should be given up. Famous boys' choirs have adopted the custom of 'caring' for the voice of their singers in the period of their mutation as well. (E.g.. Tölzer Knabenchor, Regensburger Domspatzen). The advancement of mutation needs to be monitored because changes may occur almost on weekly basis.

In case of mutating boys, the following exercises are recommended for voice training:

- „buzzing" exercises together with glissando exercises of narrow voice range
- soft tone starts
- use of voiced consonants (m, n, ng, z)
- exercises with vowels (primarily with „o" and u")
- relaxation exercises (especially in the shoulder and neck area)
- prioritized consonants include b, d, g

Those vowels are to be preferred which sound the best without any supplementary noise or murmur. Especially, singing with 'i" and „a" may create a lot of problems initially. Singing 'i" and „e" may be an extremely difficult task until the period of post-mutation. The best vowel to practice in the period of mutation is „o". A good task is to sing easy songs with the syllable „lo".

During mutation the girls' voice deepens with about one tercet, but it is also a possibility that it does not change at all. Mutation may be seen in a simple voice change: it becomes airy or coarse. The direction of change in voice range is not common, since there are some girls, who sing in higher, or some, who sing in lower voice after the period of mutation, or there are some, whose voice does not change at all. Generally, it may be noted that girls' voice changes gradually from a girlish voice into a 'fuller', velvety female voice. No specific voice training exercises are needed for girls in the period of mutation. When their voice becomes coarse some pause, and rest is needed. The voice may occasionally become airy until the age of 20.

On the other hand, some exercises are recommended in order to get a mature and clear female voice from the airy girlish singing. These exercises are as follow:

- „buzzing" and glissando exercises in the full range of sounds
- soft tone starts

- breathing exercises – activation of the diaphragm
- articulatory exercises
- staccato exercises
- preferred consonants are b, d, g, z, r, m, n, ng, l

6. SUMMARY

Children can only imitate a teacher who sings lightly in ringing voice. This is why it is of utmost importance that the music teacher, voice teacher, lower primary school teacher or kindergarten teacher sing in thin, shiny and ringing voice.

A rapid increase in the number of psychological problems and psychosomatic diseases is a warning sign that needs to be considered with the aim of prevention when working in the area of singing, music or arts at all educational levels. Voice and singing have the power for self-expression, but, unfortunately, it has almost been lost for today. The re-introduction of this function might be helpful on the one hand in preventing psychological problems, and, on the other, in gaining joyful experiences through singing and music. Through their common aims, including the joy of singing, self-expression and self-development music education and music therapy are strongly bonded. They do not weaken, but they do strengthen each other instead: they are to shape and embetter the human soul. It is of utmost importance to have a free, creative, and successful atmosphere in the classroom with a sense of accomplishment, in which there is a possibility for self-expression, for paying attention to themselves and also to each other, and communication with the help of singing, music and movements. As a result, those obstacles will disappear which prevent them from behaving appropriately and achieving what they are capable to do.

Voice production errors, as it was previously mentioned, with time can be corrected with appropriate exercises, targeted development, perseverance, and patience. This is the task of well-trained voice teachers, choral conductors, and music teachers, who should be familiar with the specific characteristic features of children's voice and singing. The thorough knowledge of these specificities is very important, since without its teachers are unable to correct the errors. Voice production also has a tremendous influence on the personality of singers, consequently, this feature also needs to be considered.

Singing and music in themselves lead to the experience of inner harmony for all those who are engaged in these art forms. Music can arouse and intensify activity, regulate tension and stress, it arouses anger and is able to drain it. It can create peace of mind, mobilizes various emotions, stimulates imagination, associations, phantasy, and memories. It has an impact on how children feel in general and shapes behavioral patterns. In addition, music has a significant aesthetic impact. It enables children to connect without speaking with one another, helps them to overcome inhibitions and relieves tension and awakens hidden abilities and talent.

Singing and music are highly recommended if children have to cope with learning difficulties, learning disorders, behavioral disorders, problems of self-expression, communication problems, inhibition, integration disorder, difficulty concentrating and attention disorders.

Those children who have experienced the magic of singing and music, will take pleasure in being immersed in the wonderful world of music notes and rhythm.

It is thought that music teachers always have to remember the following:

1) „Singing is one of the most wonderful exercises to learn about the body. When singing the child's brain has to modulate the vocal cords in a virtuoso way in order to produce the most appropriate sound. This is the best fine motor exercise, and, at the same time, it is the precondition of all later differentiated way of thinking." (*Gerald Hüther, a German brain researcher and developmental neuropsychologist. Quoted in* Élet és Tudomány 2009/13)
2) „Voice production when playing, speaking, humming, or singing will develop spatial orientation, attention, the ability to make a distinction between the individual sounds and memory. Music contributes to the refinement of sensory organs and the musical and rhythmic components of language support higher level cognition. Music also helps the brain and the body to function in unison when producing uniform sounds, so the body itself becomes a means of expression, a musical instrument." *(From the book by Sally Goddart Blyte: A kiegyensúlyozott gyermek)*
3) Singing voice sounds at its best when all the factors of significance including breathing, the larynx (sound start), resonance conditions and the phonetic phenomena of choral music all function correctly. The teaching of the individual elements of music requires a different approach in every age group, similarly, sound production always has to consider the age of the learner.
4) „Activities, including physical exercise and singing stimulate the brain with emotions and activates it with the help of diverse auditory, visual and motor stimuli." (By *Klára Kokas: Képességfejlesztés zenei neveléssel*)

It may happen, that although the vocal organ is healthy, no sound or hardly any sound is produced. In order to have a good vocal function the healthy organs are not enough. The entire organism, the person as a whole, his inner motives are needed, too for the organs to function perfectly. If all these features are in order, then the person is in good mood, and it enables him to produce the ideal sound. The sound relates back on the mood, too, and may improve it further. The sound experience has an impact on the personality, too. It is the human being that changes through the sound experience, which means, when they experience their own voice and live it intensely, something will change in their personality, too.

„There is a song in the soul of everybody,
and the person hears his own soul in every song.
And who has a beautiful chant in the soul,
that hears the song of others beautiful. “

Mihály Babits

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