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THE EFFECT OF SINGING EDUCATION ON SOME PRESCHOOL EDUCATION STUDENTS' MUSIC ACHIEVEMENTS

Abstract

Singing education is an important segment of educating students – future preschool teachers at faculties of preschool teacher education. Singing is an elementary mode of children's music expression. The task of future preschool teachers is to gain knowledge and awareness about the importance and influence of singing on children's development. Because children learn through imitation, there is a strong effect to be found in the preschool teacher's singing which entails intonational stability, steady rhythm and text articulation. This research was founded on quasi-experimental method of pedagogic research and it examined the way in which various modes of learning influence the intonational and melodic abilities development and the voice range of the subjects. Female students of Faculty of Teacher Education in Zagreb – Department of Petrinja (N=36) participated in the research which lasted two academic years (2012/2013 and 2013/2014). They were divided into two groups, experimental and control group. The research lasted fifteen-weeks. According to Mann Whitney U test results, we found statistically significant progress in intonational and melodic accuracy, and widening the voice range of the experimental group, in comparison with the control group. The research yielded the conclusion that singing activity through a certain time period, whether led by expert vocal instructions, or intuitive singing, leads to progress in intonational and melodic accuracy and widening the voice range.

Key words: intonational accuracy, learning modes, melodic accuracy, singing education, students of preschool teacher education faculty, voice range, research

Izvleček

Učinki pevskega izobraževanja na nekatere glasbene dosežke študentov predšolske vzgoje

Pevsko izobraževanje je pomemben del izobraževanja študentov predšolske vzgoje – bodočih vzgojiteljev. Petje je osnovna oblika glasbenega izražanja otrok, zato morajo bodoči vzgojitelji pridobiti ustrezno znanje in se zavedati pomena in vpliva petja na otrokov razvoj. Vzgojiteljevo petje, ki vključuje intonančno stabilnost in enakomerno izvajanje ritma ter besedila močno vpliva na otroka, saj se otroci učijo s posnemanjem. Z raziskavo, ki je temeljila na kvazi-eksperimentalni metodi pedagoškega raziskovanja, smo preučevali, kako različne oblike učenja vplivajo na razvoj intonančnih in melodičnih sposobnosti ter obseg glasu udeleženk. V raziskavi, ki je potekala v dveh šolskih letih (2012/2013 in 2013/2014) so sodelovale študentke Pedagoške fakultete v Zagrebu – oddelek Petrinja (N=36). Razdeljene so bile v dve eksperimentalni in eno kontrolno skupino. Raziskava je potekala v 15 tednov. Po rezultatih Mann Whitney U testa sta eksperimentalni skupini pokazali statistično pomembnejši napredek v intonančni in

melodični točnosti ter širitvi glasovnega obsega od kontrolne skupine. Z raziskavo smo ugotovili, da pevska dejavnost, bodisi vodena s strokovnimi vokalnimi navodili bodisi intuitivno petje v določenem časovnem obdobju prinese napredek v intonančni in melodični točnosti in širitvi obsega glasu.

Ključne besede: intonančna točnost, melodična točnost, oblike učenja, obseg glasu, študenti predšolske vzgoje, raziskava

Introduction

The basic goal of education is the autonomy in shaping an independent and responsible individual who knows how to think. According to the *Bela knjiga o vzgoji in izobraževanju* (*White Book of Education;* 2011), education in schools and kindergartens should follow the principle of objectivity, plurality and criticism. Autonomy and competences are important components of preschool teachers, teachers and other professional staff. The autonomy of educational institutions in the system of education prides itself in righteousness, solidarity and availability of knowledge for all. Linking the basic goal of education, music education entails professional conduct and appropriate training of the preschool teacher, the one who nourishes the positive attitude towards music activities; music achievements and his/her own music abilities. The goal of music education in universities is: to educate and widen their music abilities, skills and possibilities; to build a positive attitude towards music and its implementation in working with children; to comprehend the reach of music's function in children's development. University's task is to take care of the planned, humanly just and educated future of a competent and self-confident preschool teacher for the performance of music activities, especially singing. Children's music education is the key to society's development on all levels of functioning. Careful and appropriate care in the preschool period is of essential importance for individual children's growth, which in turn contributes to society's betterment (Lee, 2009).

UNESCO's *Guidelines* in *Road Map for Arts Education* (2006) advocates the development of aesthetic sense, creativity and the ability of critical thinking. It also upholds reflectiveness as an innate human ability, and all through artistic education as a fundamental right of every child and young person. The awareness of music's intrinsic attributes carries within itself the responsibility of persons of authority for implementing music and its positive attitude about the self-efficiency in teaching music into the educational process, considering children's backgrounds (Özgül, 2009; Bond, 2012). Quality education of preschool teachers is of the utmost importance for future work in preschool institutions (Nichols, Honig, 1995; Temmerman,1998; de L'Etoile, 2001; Vannatta-Hall, 2010).Singing education is a part of students'- future preschool teachers' music education, and an indispensable activity with children in kindergartens.

Forms of learning in singing education

Music education applies certain methods and forms of learning (Denac, 2010). Singing education is one of the action methods of work. Such working method is designed for

achieving a specific goal (Pranjić, 2005), and it is singing. Learning through imitation or learning by succession is a method which transfers singing knowledge from preschool teachers to children (Denac, 2002). Preschool teachers demonstrate how to do something, and children imitate and repeat what was demonstrated. This method has a goal of acquiring skills and developing motor abilities such as singing. Imitation is inner succession, i.e. inner performance of some activity (Pranjić, 2005). According to Terhart (2001), it resembles the imitation method – when, during work, an expert demonstrates and explains certain work operations or procedures which are to be mastered. He/she simplifies (adjusted for the age in question) the performance of hard actions and checks the practice process and the degree to which the learner has acquired the desired procedures.

Singing is a psycho-motor component, working and practical part of the educational aspect. It includes affective as the impression of what is heard, and cognitive process as learning and analysing a song, learning about art in general. Certain learning strategies can be closely linked to singing education. Singing is taught through teaching, discovery, experiencing through methods of music reception, expression -interpretation, practicing and creation. Due to mutual intertwining of various working methods, singing education is very complex, but all in the purpose of achieving a goal and sensitising the individual through psycho-motor, sensory (auditory), cognitive and affective segment.

The quality of music matter presentation to the learners depends on social forms of learning. One of the simplest forms of work, due to its all-time efficiency and information's availability, according to Stevanović (2001), is frontal way of working. Such form of work has its drawbacks. Frontal teaching neglects individuality, interests and needs of the individual. Group form of work is characterised by uniqueness of goal, discipline, work division, system of communication, culture of dialogue, education for cooperation and respecting the interlocutor, and equality in participation. Considering the fact that it is a social-psychological process, its results are both individual and social (Vukasović, 1995; Bognar, Matijević, 2002). Working in pair is marked by togetherness and student's independence. In it, characteristics of personality are noticed, such as friendship, mutual trust, and communication's development, realisation of self, one's own ambitions, interests and identity. Individual form of work encompasses individual activity according to his/her intellectual capacities and psychological-emotional predispositions. Because it relies on internally conditioned individual's personality, individualisation is a tool for teaching optimalisation (Bognar, Matijević, 2002). Individual work is productive by character because of the self-education taking place and making the acquired knowledge more lasting (Stevanović, 2001). Considering the diversity of the learning forms, their advantages and disadvantages, Terhart (2010) considers they are best used in combination, with the purpose of greater efficiency. The stated forms of work are not always present in singing education. This greatly depends on the attitude of people who constitute a group. In kindergartens, children sing in group more often, individually or in a pair less often. Frontal way of working is present mostly when the preschool teacher demonstrates a song.

Forms of work are ways of organising the relationship of the teacher and learner (Pranjić, 2005). All social forms of work should be nourished and combined so that the learning process becomes more versatile, richer and more productive. The simplest form of work for the person who teaches is the frontal, while group work, work in pairs or individual work requires more effort (Jelavić, 2008).

The research will show the effect of using individual and group work mode on the singing abilities of students of faculties for preschool teachers. In the area of tertiary education, the use of learning modes depends on their inclusion in the study programmes, considering programme's design of certain courses.

Methodology

Research problem, goal and hypothese

Research problem is based on the singing education inclusion into course programmes on teacher education faculties, considering the differentiation of music and singing abilities of students at faculties of preschool teacher education. The goal is to observe the effect of shaping the voice of these students, with the use of individual and group modes of learning, in relation to the control group. More specific goal is to examine how much additional work, through singing education of the voice with basic techniques, contributes to the betterment of intonation, accuracy in singing melodic patterns, and widening the voice range in students of preschool teacher education faculties.

The hypothesis is set according to the research problem and goal:

H: We assume that, in the experimental groups, in which a certain singing treatment will be applied, there will be progress in the intonational accuracy, accuracy of performing melodic patterns and widening the voice range, in relation to the control group.

The sample

The sample was deliberate and not random. 36 students of Faculty of Teacher Education in Zagreb, Department of Petrinja, participated. Two generations of students were included in the research, because Faculty of Teacher Education in Zagreb-Department of Petrinja enrols 25 students in the *Early and Preschool Education* department every year. Students in the academic years 2011/2012 and 2012/2013 participated.[1] The method of research groups equalization was realised according to relevant factors (Mesec, 1997), which are the same population, considering the year of study, and subjects' gender.

1 The students who participated in the research in 2011/2012 attended expert preschool education college at the time. Students who participated in the research in the academic year 2012/2013 enrolled at the faculty with university programme of early and preschool education. The difference between university and expert studies is non existent in the number and the content of the courses. The difference lies in the time frame of the courses. *Instrumental accompaniement with singing I* started in the third term for the programme of expert preschool teacher studies, while it is being taught in the fourth term of university programme.

Table 1: Structure of students in regards to the research group

Group	Work mode	Abbreviation	N
Experimental 1	Individual	E1-In	12
Experimental 2	Group	E2-Gr	12
Control		Cg	12

The research was conducted in the frame of *Instrumental accompaniment with singing 1* which is a second year course of preschool education studies at the Faculty of Teacher Education in Zagreb. Each group had 12 subjects (table 1). All 36 subjects of the sample were of the female gender.

Research structure plan

This research is a quasi-experiment or not a real experiment (Mesec, 1997). It is an action research consisting of one action step in which there were no deflections from the planned design (15 weeks of singing treatment). The quasi-experimental research observed the effect of a certain singing treatment on the singing development, based on the basics of vocal technique and different learning modes. Two experimental and one control group were included in the research concept. Experimental groups had a certain singing treatment. One group worked individually, and the other as a group. Control group had no particular singing treatment, but was included into the regular study programme of early and preschool education. All three groups had the same initial and final testing.

Singing lessons work course

Singing lessons lasted 30 minutes and they were designed in three phases. The first phase was singing warm-up. Second phase was applying vocal techniques in singing children songs. Lastly, the third phase was vocal settling. The applied singing warm-up was based on the interval method, and the interval is the static of each melody. The interval method is known from the 18^{th} century. Such concept was laid out by Nicola Vaccai (1790–1848), Italian composer and opera composer. He designed short, clear and useful exercises, which are enjoyable and medically justified from the physiological and anatomic aspect. These exercises are based on the range which is pleasant to most voices, and it is from c_1 to f_2 (for male voices it is an octave lower; Vaccai, 1878). The laid out principles of the singing warm-up and interval exercises with various syllables (mi, po, pa, vi, li, ju, je, ma…) were use in working with students who encountered the basics of singing techniques for the first time. The use of consonants in the singing warm-up, according to Špiler (2012), gives a vocal the character of a syllable, which is an integral part of a word. Vowels and consonants carry within themselves the changes of the colour of the voice sound, which creates a sense of divergence and contrast, alongside logical word accentuation. The combination of vowels and consonants enables the vocal apparatus' habituation to some particular activity, and certainly is a recommendation against holding on to one vocal for too long, in order not to create a fixation of the vocal organ and stiffening of the muscular mechanism of the whole instrument.

Testing procedure

The testing of music abilities was done individually, and the subjects were distributed in research groups. The testing, singing treatments with the individual group and the group, was noted by dictaphone. The dictaphone wasn't used with the control group, except in the initial and final testing. The research was carried out in the venues of Faculty of Teacher Education in Zagreb- Department of Petrinja.

Instrument

The research used a measuring instrument designed for it particularly, and in was in the form of testing music elements. The testing was based on the hearing test principle, because faculties for teacher education don't include music abilities testing.[2] It consists of three elements. The first tested element is the intonation of individual notes in the middle register of most subjects (ten notes from h to c_2). The second element tested was the accuracy of repeating the melodic patterns of five notes. Ten melodic patterns were composed according to the interval principle and separated triads in ascent, descent or in combinations (major and minor fifth chords and twists). The testing was done in a way that the examiner sang a certain note with the neutral syllable »na«, with the piano, and the subject had to repeat it without the piano. The third element of testing examined the voice range. The initial tone was c_1. The testing was done chromatically, in ascension and descent, according to the scale principle. The reliability of music abilities testing was measured by three elements for the initial and final testing. Reliability coefficient Cronbach Alfa has shown satisfactory level in checking music elements (α=0.810).

Data analysis and the used statistical methods

The basic research method is descriptive and quasi-experimental method of pedagogic research. For basic data analysis, descriptive statistics was used and expressed in frequencies (f), percentages (%), arithmetic means (M), dominant values (mod), middle values (Md), standard deviation (SD) and measures of normal distribution (skewness, kurtosis). Because the prerequisite for normal distribution wasn't fulfilled, we used nonparametric Mann Whitney U Test and Wilcoxon Rank-Sum Test (p=0.05) to test the hypothese.

The assessment scale for testing music abilities of intonation, melodic patterns and voice range

For the sake of simpler systematisation and easier processing of the gathered data, the scale of test assessment has clearly defined degrees. Ten notes and ten melodic patterns were categorised into a scale of six items (0-1-2-3-4-5) with corresponding meanings.

2 Faculty of Teacher Education in Zagreb started testing music, art and kinesthetic abilities in 2014 for the academic year 2014/2015. The testing isn't eliminatory in character, but is awarded with extra points.

Table 2: Assessment scale for intonational and melodic accuracy

	Intonational accuracy	Melodic accuracy
0 - nothing	Not one note has been sung	Not one melodic pattern has been sung
1 - very weak	One or two tones repeated	One or two melodic patterns repeated
2 - weak	Three or four tones repeated	Three of four melodic patterns repeated
3 - good	Five or six notes repeated	Five or six melodic patterns repeated
4 - very good	Seven or eight notes repeated	Seven or eight melodic patterns repeated
5 - excellent	Nine or ten notes repeated	Nine or ten melodic patterns repeated

The voice range is expressed in the number of notes sung by the subjects in their ambitus, according to which four categories of the voice range were made.

Table 3: Voice range distributed according to the categories and number of notes

Category I (the range couldn't be measured because not one note has been sung)	
Category II (the range of one octave or less)	up to 13 tones and the 13th tone
Category III (the range more than one octave and up to the second octave, including the first note of the second octave)	14 - 25 notes and the 25th note
Category IV (the range bigger than two octaves)	from 26th tone further

Interpretation of the results

Subjects' results, divided into three groups, are shown in the tables according to the initial and final results. The results are presented according to each tested music element in regards to the particular group of subjects, and between all subjects, regardless of the research group. Tested music elements are intonation, melodic patterns and voice range.

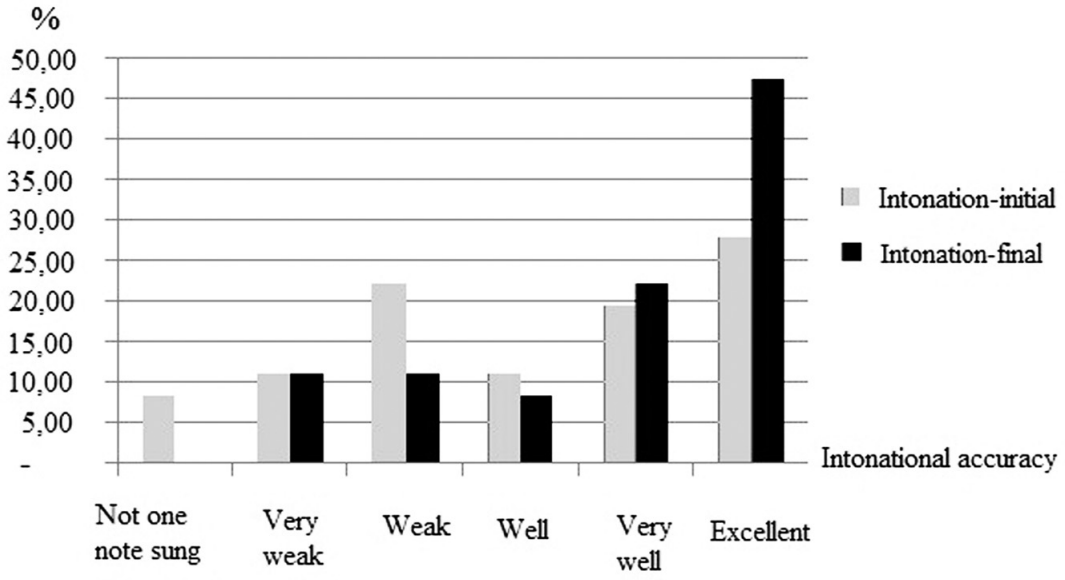
Intonational accuracy of all subjects

The results in intonation were measured by the number of accurately repeated notes. Subjects repeated the group of ten notes, which was categorised according to the assessment scale (0-5).

In the initial testing (IT), from 36 subjects, the most (27.8%) have shown themselves excellent in intonation (nine or ten notes repeated), while 8.3% of the subjects haven't sung any notes. In the final testing (FT) the greatest percentage (47.2%) have repeated nine or ten notes. There aren't any subjects who haven't repeated even one note, while 22.2% of the subjects repeated the intonation in the weak or very weak degree.

Figure one presents the comparative results of the initial and final testing for intonational accuracy according to the individual note.

Figure 1: Comparison of the intonational accuracy in IT and FT with all subjects

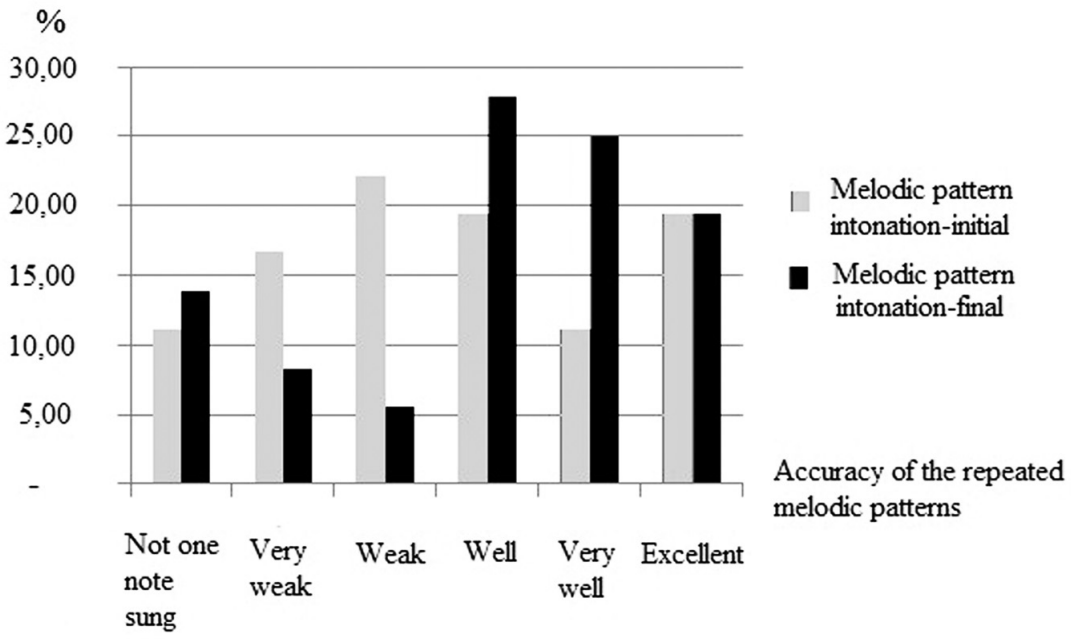


By comparing the initial and final testing, we notice a progress in the intonational accuracy. After a certain time, all of the subjects have shown progress, regardless of the research group they belonged to. In the initial testing, three subjects haven't sung even one note, while there were no such subjects in the final testing. In the category with one or two notes sung the number of subjects remained the same. In the weak category (three or four notes repeated) there were eight subjects in the initial testing, while in the final testing that number was reduced to four. The greatest difference in progress is visible in the category of nine or ten notes repeated. In that category, the number of subjects in the initial testing (27.8%) has risen to 47.2% in the final testing. The progress in the intonational accuracy of all subjects is closely connected with continuous singing.

Accuracy of repeated melodic patterns of all subjects in the initial and final testing

According to the same principle as with the intonational accuracy of individual note, subjects were tested in the accuracy of repeated melodic patterns. 19.4% out of 36 subjects sang nine or ten melodic patterns in the initial testing. The least subjects, 11.1%, hasn't sung even one melodic pattern. The same percentage of the subjects is in the category with seven or eight sung melodic patterns. Most subjects have accurately sung three or four given melodic patterns (22.2%). In the final testing, 27.8% of the subjects did well in repeating melodic patterns, while 25% of them did very well. The least number of the subjects have repeated the melodic patterns weakly (5.6), while 13.9% of the subjects haven't repeated even one melodic pattern.

Figure 2: Accuracy of the repeated melodic patterns in IT and FT with all subjects



Certain progress is noticeable when the initial and final states are compared. There is progress in most categories. In the category of not one sung note, final testing shows progress (from 11.1% to 13.9%). In the category 1 (very weak), there were 16.7% of the subjects in the initial testing, while in the final testing that number decreased to 8.3%. Category *weak* (three or four melodic patterns repeated) decreased from 22.2% to 5.6% accuracy in the final testing. The decrease of the number of subjects in weaker categories has resulted in the increase of melodic samples repetition accuracy in higher categories. A significant shift happened in the category *well* (five or six melodic patterns repeated). 19.4% of the subjects were successful in that category in the initial testing and 27.8% in the final testing. In the category of seven or eight melodic patterns repeated, a jump from 11.1% to 25% of the subjects occurred in the final testing. No shifts have happened in the last, highest, category (nine or ten tones repeated). The number of the subjects remained the same in the final as in the initial testing, 19.4%.

Subjects' range according to the number of sung notes

The range is shown in two ways. It is presented in the number of notes according to initial and final note, with respect for semitone differences between the notes. At the same time, the range is shown according to the intervals which are distributed by quantity, because of the difference between the subjects, without stating the highest or lowest note.

Table 4: Subjects' voice range according to the number of notes sung IT

Number of notes sung	Interval	F	%
0	-	1	2.8
4	m3	1	2.8
8	P5	2	5.6
13	p8	1	2,8
17	M10	1	2.8
18	P11	2	5.6
19	A11	1	2.8
20	P13	3	8.3
21	Octave + m6	2	5.6
22	Octave + M6	1	2.8
23	Octave + m7	1	2.8
25	Two octaves	3	8.3
26	Two octaves + m2	2	5.6
27	Two octaves + M2	2	5.6
28	Two octaves + m3	6	16.7
29	Two octaves + M3	1	2.8
30	Two octaves + P4	2	5.6
31	Two octaves + A4	1	2.8
32	Two octaves + P5	3	8.3
Total		36	100

According to the number of notes, the range between all subjects is from 0 to 32 notes at most. The most subjects (16.7%) have sung 28 tones (two octaves and minor third). One subject (2.8%) has sung 0, 4, 13, 17, 19, 22, 23, 29, 31 notes within her range. Three subjects have sung 25 notes (two octaves), and the same number 32 notes (two octaves and perfect fifth).

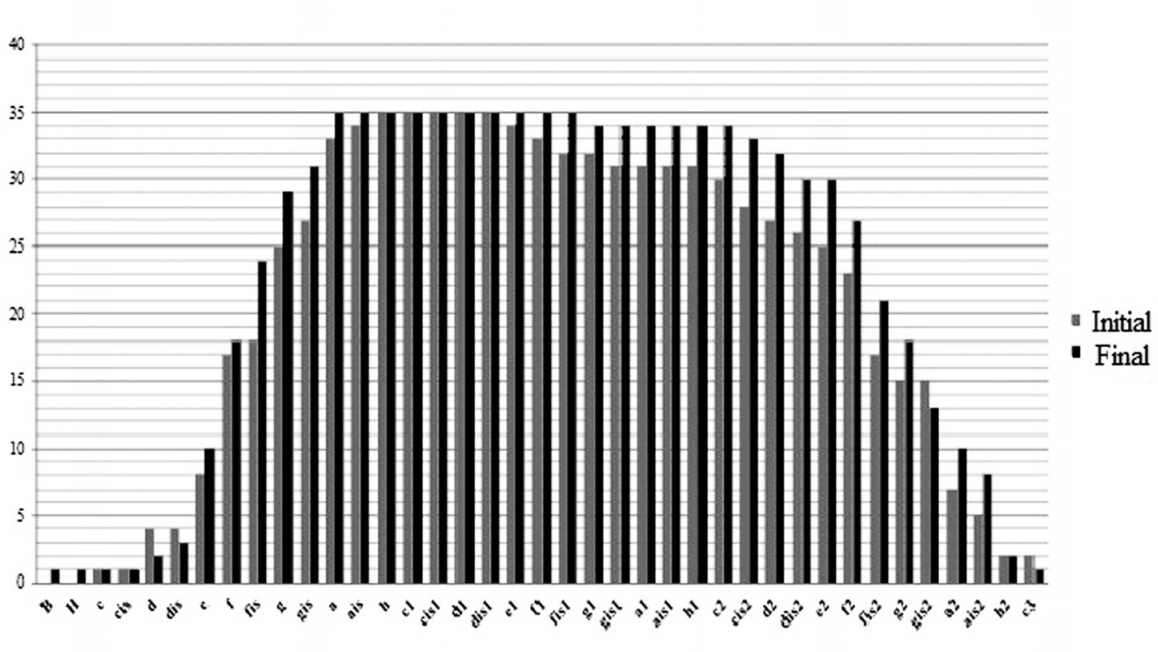
Table 5: Subjects' voice range according to the number of sang notes –FT

4	m3	1	2.8
13	P8	1	2.8
15	M9	1	2.8
18	P11	1	2.8
19	A11	1	2.8
21	Octave + m6	1	2.8
22	Octave+ M6	4	11.1
23	Octave + m7	1	2.8
24	Octave + M7	3	8.3
25	Two octaves	2	5.6
26	Two octaves + m2	3	8.3
27	Two octaves + M2	4	11.1
28	Two octaves + m3	4	11.1
29	Two octaves + M3	3	8.3
30	Two octaves + P4	1	2.8
31	Two octaves + A4	1	2.8
32	Two octaves + P5	2	5.6
33	Two octaves + m6	2	5.6
Total		36	100

In the final testing, the lower number of notes sung by one subject (2.8%) is 4 notes (minor third). The most notes, 33 notes (two octaves and minor sixth), was sung by 5.6% of the subjects.

The difference in the voice range can be applied in the initial and final testing. The progress in widening the range is present. There were no subjects who weren't able to sing even one note in the final testing. The maximum number of notes increased from 32 (two octaves and perfect fifth) in the initial testing to 33 (two octaves and minor sixth) notes in the final testing. The number of the subjects who sang 22 notes (octave and major sixth) has risen from 2.8% to 11.1%. The same percentage of the subjects have sung 27 (two octaves and major second), i.e. 28 notes (two octaves minor third).
Figure 3 shows the notes sung by the subjects.

Figure 3: Voice range in IT and FT to the octaves and the whole range of subjects



Voice range has deepened from C in the initial testing to B_1 in the final testing, while it remained the same in pitch. The highest sung tone was c_3. Most frequently, the range of the subjects was between a and c_2 in the initial testing, and in the final testing from G sharp to e_2 in the final testing. This note range covers most subjects, while measured notes on the extremes were represented the least. Only one subject has displayed great range, which reached the depth of B_1, and it was an example of a student with very low alto. The highest note c_3 was sung by two subjects.

Subjects' voice range according to the determined categories

Measured subjects' voice range was distributed in four categories. The first is the one in which the range couldn't be measured, i.e. in which the subjects haven't sung any notes rendering the range impossible to measure. The subjects with the range less than an octave and with an octave (to 13 notes and the 13th note) comprised the second category. The third category includes the subjects with the voice range larger than one octave, and reaching to two octaves, including the upper note of the second octave (14-15 notes, and 25th note). The fourth category is made of the subjects whose voice range is greater than two octaves (from 26th note), but doesn't cross into the third octave.

Table 6: Subjects' voice range according to the categories IT

Voice range category	f	%
I (not measured)	1	2.8
II (octave)	4	11.1
III (two octaves)	14	38.9
IV (over two octaves)	17	47.2
Total	36	100

All four categories are present in the initial testing of the range. One subject's range couldn't be measured (2.8%). Most subjects (47.2%) have the voice range greater than two octaves.

Table 7: Subjects' voice range according to the categories FT

Voice range category	f	%
I (not measured)	0	0.0
II (octave)	2	5.6
III (two octaves)	14	38.9
IV (over two octaves)	20	55.6
Total	36	100

Final testing has shown the increase in the subjects' voice range in comparison to the initial testing (Table 7). After the singing treatment, the subject whose voice range couldn't be measured managed to sing the notes in her range. So, the first category isn't present in the final testing. The second category, which was 11.1% in the initial testing, has dropped to 5.6% in the final testing. The third category has remained the same (38.9 %). The greatest progress is visible in the fourth category. Subjects' voice range has risen from 47.2% to 55.6% in the final testing.

Tested music elements according to the groups

Table 8 shows the descriptive statistics results of all the elements initially and finally tested in groups. In the continuation of the presented results, *the range* of the measured elements *according to the number of tones* won't be displayed. The stated results are for *voice range according to the categories* because such presentation is musically simpler and clearer.

Table 8: Music elements of all groups

Group		N	Min	Max	Mean	SD	Skewness		Kurtosis	
E1 –In										
	Intonation IT	12	0	5	**3.17**	1.749	-0.426	0.637	-1.101	1.232
	Intonation FT	12	1	5	**4.00**	1.477	-1.219	0.637	-0.061	1.232
	Melodic pattern T	12	0	5	**2.75**	1.712	0.073	0.637	-1.169	1.232
	Melodic pattern FT	12	0	5	**3.25**	1.603	-0.805	0.637	-0.002	1.232
	Range (categories) IT	12	1	3	**2.00**	0.739	0.000	0.637	-0.856	1.232
	Range(categories) FT	12	2	3	**2.67**	0.492	-0.812	0.637	-1.650	1.232
E2– Gr										
	Intonation IT	12	0	5	**2.08**	1.505	0.408	0.637	-0.111	1.232
	Intonation FT	12	1	5	**3.42**	1.564	-0.499	0.637	-1.355	1.232
	Melodic pattern IT	12	0	5	**1.67**	1.435	0.926	0.637	1.542	1.232
	Melodic pattern FT	12	0	5	**2.42**	1.621	-0.205	0.637	-0.981	1.232
	Range (categories) IT	12	0	3	**2.08**	0.900	-1.082	0.637	1.492	1.232
	Range(categories) FT	12	1	3	**2.08**	0.669	-0.086	0.637	-0.190	1.232
C										
	Intonation IT	12	1	5	**3.92**	1.311	-1.270	0.637	0.946	1.232
	Intonation FT	12	1	5	**4.08**	1.240	-1.558	0.637	2.454	1.232
	Melodic pattern IT	12	1	5	**3.42**	1.379	-0.666	0.637	-0.218	1.232
	Melodic pattern FT	12	0	5	**3.33**	1.723	-1.260	0.637	0.807	1.232
	Range (categories) IT	12	2	3	**2.83**	0.389	-2.055	0.637	2.640	1.232
	Range(categories) FT	12	2	3	**2.75**	0.452	-1.327	0.637	-0.326	1.232

The range of items on the scale for *intonation* element is maximal (0-5) for the group of individuals and the group, while the range of items for the control group is 1-5 in the initial testing. The range of the items for all three groups is in range of 1-5 scale in the final testing. According to the arithmetic mean, intonation in *E1-In* is 3.17 in the initial testing, and after the individual singing treatment it has risen to 4.00. The rise is also visible in *E2-Gr*. The average intonation is 2.08 in the initial testing, and it has risen to 3.24 in the final testing. *C group* had the greatest arithmetic value in the intonational accuracy between all groups in the initial testing, and it was 3.92%. Intonational accuracy has risen to 4.08% in the final testing.

The dispersion of items on the scale for *melodic pattern* element is maximal (0-5) in the experimental groups, besides the control group (1-5). The items dispersion is maximal

(0-5) in all groups in the final testing. Arithmetic mean of the *E1-In* of 2.75 in the initial testing has risen to 3.25 in the final testing. For *E2-Gr* it rose from 1.67 to 2.42 in the final testing. For *C group* the difference in the initial and final testing goes in the opposite direction. It has slightly decreased from 3.42 in the initial testing to 3.33 in the final testing.

There is a noticeable difference between the initial and final testing in the range. Group *E1-In* has increased the average range of up to two octaves in the initial testing to the range of more than two octaves in the final testing. In the group *E2-Gr* there hasn't been any shift between the initial and final testing, but it remained within the same range – to two octaves. In *C group* the average in range categories was greater than two octaves in the initial and final testing.

These results show that a certain time of singing practice leads to hearing stabilisation improvement, intonational accuracy betterment and voice range increase. A very small, almost insignificant, drop is noticeable in melodic patterns in *C group* almost in the final testing. Subjects' vocal range hasn't increased in comparison with the initial testing, but has slightly dropped in the final testing.

It is visible that singing treatment increases vocal abilities in all measured areas (intonation, melodic patterns and range). Intonation has improved in both groups, experimental and control group as well. Vocal technical practice, whose role is to widen the range and stabilise the intonational accuracy in persons with unstable singing abilities, has progressed the singing betterment in all the tested segments. Phases in the singing process are of utmost importance. Each singing treatment should be initialised with singing warm-up. According to the American research (Gish et al., 2012), more than half (54%) of the Masters of Music, Doctors of Music and singing teachers (N=117) exercise the singing warm-up for 5-10 minutes before singing, and only 22% uses vocal settling after singing. Singing warm-up is a type of warm-up for the vocal apparatus which includes technical vocal drill. That research hasn't shown that education's degree influences the effect of singing warm-up. Singing warm-up exercises have an important effect on raising awareness of the vocal apparatus and the way it functions, on the hearing stabilisation and widening of the range. According to Harvey (1997), singing warm-up is the key to maintaining vocal motor skills and health, but it also has a preventive character in vocal chords injuries. The research done by Barnes-Burroughs and Rodriguez (2012) has shown that singing warm-up is a very useful practice before the lecture, and not exclusively before singing.

Experimental group (individual and group singing treatment) in comparison with the control group

Considering the problem question about the difference in the singing between experimental groups and the control group over a certain period of time, the following hypothesis was set:

H: It is assumed that in the experimental groups, in which a certain singing treatment will be used, there will be progress in intonational accuracy, accuracy of performing melodic patterns, and widening the voice range, in relation to the control group.

To test the hypothesis, Mann Whitney U Test was used first in order to test the existence of the difference between the control and experimental group in certain items, where the measure of statistical significance is $p \leq 0.05$ (table 9). Music element *range* is only presented according to the categories because it is musically more significant and clearer than presentation according to the number of tones.

Table 9: Mann Whitney U test

	Intonation IT	Intonation FT	Melodic pattern IT	Melodic pattern FT	Range (categories) IT	Range (categories) FT
Mann-Whitney U	82.000	129.000	81.500	114.500	61.000	99.000
p	**0.016**	0.296	**0.016**	0.156	**0.001**	0.043

According to Mann-Whitney U Test and the ranks, the difference between experimental groups and the control group in all tested items is visible (table 10). These items show the initial results in intonational accuracy of individual tones, melodic patterns and voice range. It is noticeable that the control group had significantly better results in the initial testing from both experimental groups in all tested areas. The results show a positive growth for the experimental group in the final testing, while this can't be said for the control group according to the areas of testing.

Table 10: Differences between experimental groups and the control group in the measured item

	Skupina	N	M_{rank}
Intonation IT	E1- In E2 – Gr	24	15.92
	C	12	23.67
Melodic pattern IT	E1- In E2 – Gr	24	15.90
	C	12	23.71
Range (categories) IT	E1- InO E2 – Gr	24	15.04
	C	12	25.42
Range (categories) FT	E1- In E2 – Gr	24	16.63
	C	12	22.25

Wilcoxon Signed Ranks Test was used with the goal of determining whether the changes in certain items occurred between the initial and final state (in the experimental and

control group). Table 11 shows the results of the nonparametric test for related samples – Wilcoxon test ($p \leq 0.05$).

Table 11: Wilcoxon Signed Ranks Test

Group			M_{rank}
E1-In E2-Gr	Intonation FT – IT	Negative Ranks	4.50
		Positive Ranks	9.28
	Melodic pattern FT - IT	Negative Ranks	6.00
		Positive Ranks	7.62
	Range (categories) FT – IT	Negative Ranks	5.50
		Positive Ranks	5.50
C group	Intonation FT – IT	Negative Ranks	0.00
		Positive Ranks	1.50
	Melodic pattern FT – IT	Negative Ranks	3.00
		Positive Ranks	3.00
	Range (categories) FT – IT	Negative Ranks	2.00
		Positive Ranks	2.00

Table 12: Differences in the initial and final testing in the experimental groups and the control group

Group		Intonation FT - Intonation IT	Melodic pattern FT – Melodic pattern IT	Range (categories) FT – Range (categories) IT
E1- In E2 – Gr	Z	-3.478[a]	-3.095[a]	-2.530[a]
	p	**0.001**	0.001	0.006
C group		-1.414[a]	-0.447[b]	-0.577[b]
		0.079	0.328	0.282

As Table 12 shows, the statistically significant difference between the initial and final state has been confirmed in the experimental groups, i.e. there has been a change in all items in the final testing (intonation, melodic patterns and widening the voice range) in relation to the control group. That confirms the hypothesis which assumed that in the experimental groups, in which a certain singing treatment will be used, there will be progress in the intonational accuracy, accuracy of performing melodic patterns and widening the voice range in relation to the control group.

The results of the research done by Siupsinskieneova, Lyckeova (2011) also confirm the findings of this research. According to the mentioned authors, vocal training has positive quantification effects on voice abilities. Trained singers show an increase in vocal abilities in range for the pitch, because practise hardens muscles of the larynx, which can then in turn endure greater vocal demands. Vocal practice has great influence on the respiratory capacity and mobility of the larynx. It is confirmed that singers, in relation to non-singers, show a difference in the singing profile. For adults and for kids as well, training has

influence on the voice range and intensity. Vocal profiles show clinically and statistically significant difference between singers and non-singers. Vocal training has positive influence on singing, but also on vocal abilities.

Scientific and exact approach to singing educates students for controlled singing, self-control and differentiating quality singing features. Latukefu (2010) points out that knowing the anatomy, physiology and the functioning of the vocal apparatus, leads to understanding one's own singing. Such knowledge contributes to singing competence of preschool education students – future preschool teachers

Conclusion

The research with preschool education students at the Faculty of Teacher Education in Zagreb – Department of Petrinja shows that singing treatment gives results over a certain period of time. It's been shown that no expert guidance is necessary for intonational accuracy's betterment. Intonation can be improved by intuitive singing over a longer time period. It would be expected that intonational accuracy's betterment is also linked with the accuracy in singing melodic patterns, but this research hasn't shown so in the control group. For the voice range category, the improvement in the control group wasn't expected because no appropriate singing method, which would lead to widening the range, was applied.

Singing is a developmental skill dependent on the vocal and mental capacity of the learner, time interval and the individual's engagement. That fact is confirmed by a research done by Aaron (1993) in Pennsylvania. This research showed that vocal progress was made as a result of directed singing exercises in classes for 40 minutes a week. With the expert guidance, the insecure singers have bettered their quality of singing. Singers who worked individually and in a group also displayed progress in achieving intonational stability and widening the voice range.

This action research, according to its features, can be set as a trial theory which is contextually linked to the singing treatment with the non-random group of preschool education students at the Faculty of Teacher Education in Zagreb – Department of Petrinja. From this reason, it can't be a general theory because the results should be substantiated with additional research by dividing and defining additional research problems, questions and goals, and a bigger sample. The research results have shaped the trial background theory of a narrower range which can be applied in certain areas or under certain conditions (Valenčič Zuljan et al., 2007).

Time interval of active singing engagement influences the development of music and singing skills. Special singing treatment, with individual and group approach, influences the development of singing skills in the short period. Progress in singing skills development is possible through intuitive singing, because continuous singing without expert instruction also yields betterment in intonational accuracy and widening the voice range. The finest progress is achieved with individual singing, then through group approach, and finally by intuitive singing. Singing treatment enables stability in singing

intervals and leads to widening the voice range. Singing can be a taught skill, and the speed of singer's perception and progress depends on the predispositions of the singer himself/herself.

Much research has affirmed that singing can be taught and improved over time, and that the invested time and regular technical drill influence the quality of performance and intonational stability (Atterburry, Sicox, 1993; Persellin et al., 2002; Richards, Durrant, 2003; Rutkowski, Snell Miller, 2003; Hornbach,Taggart, 2005; Lešnik, 2009; Mitchell et al., 2010).

Singing is a developmental skill which depends on the vocal and mental capacity of the learner, time interval and the individual engagement (Richardsa, Durranta, 2003; Rutkowski, Snell Miller, 2003). As a developmental skill, singing requires time, work continuity and maturity. As such, it is an indispensable part of music education on faculties of teacher education.

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