

THE INFLUENCE OF MUSIC EXPERIENCE ON THE ACQUISITION OF PHONEMES IN A FOREIGN LANGUAGE

UTICAJ MUZICKOG ISKUSTVA NA USVAJANJE FONEMA U STRANOM JEZIKU

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Abstract

Music is unavoidable in the world around us. Numerous studies confirm that individuals with greater musical abilities acquire a foreign language more successfully. The research explores the influence of musical experience on the acquisition of phonemes in a foreign language – English language. The paper examines: the connection between music and language, previous empirical research, interpretation of the connection between music and language and frequent problems in these types of studies. The research was conducted at the Preschool Teacher Training College “Mihailo Palov” in Vrsac. The subjects were from all three years of study, whose mother tongue is Serbian. Results were gathered through a questionnaire and a pronunciation test – the production of phonemes.

Apstrakt

Muzika je nezaobilazan element u svetu oko nas. Brojna istraživanja dokazuju da osebe sa izraženijim muzičkim sposobnostima uspešnije usvajaju strane jezike. Istraživanje razmatra uticaj muzičkog iskustva na usvajanje fonema u stranom jeziku – engleskom jeziku. U radu je predstavljeno: povezanost muzike i jezika, osvrt na empirijska istraživanja, tumačenje odnosa muzike i jezika kao i česti problemi u istraživanjima ovog tipa. Istraživanje je sprovedeno na Visokoj školi strukovnih studija za vaspitače „Mihailo Palov“ u Vršcu. Subjekti su studentkinje sve tri godine studija čiji je maternji jezik srpski. Podaci su prikupljeni korišćenjem ankete i testa izgovora- produkcije fonema.

Key words: *musical experience, segmental elements, choir, foreign language, pronunciation*

Ključne reči: *muzičko iskustvo, segmentalni elementi, hor, strani jezik, izgovor*

1. Introduction

Music and language are two phenomena which are considered separate in today's society. However, this distinction has occurred only in the later stages of their development. Jean-Jacques Rousseau believes that language was created through the evolution of song, i.e. that music and language used to be one phenomenon. According to him, music was developed from singing with the aim of conveying thoughts and feelings. Only later did it break off into speech and music (Antonović, 2004 as cited in ĐORĐEVIĆ, 2011). Darwin contributes to this view with his claim

that musical sounds are among the fundamentals of language development (DOLMAN & SPRING, 2014). Brown (2001, as cited in DELOGU ET AL, 2009) asserts that the connection between language and music exists because they evolved from the same phenomenon, the so called “musilanguage”, and not because of accidental parallels. The fact that more than a half of the world’s languages belong to the group of tone languages supports this primordial connection.

The close connection between these two phenomena is evident in examples where it is hard to define whether we are talking about language or music. Whistling and drums are used as communication means in certain African tribes. Poetry, a key property of which are sonic characteristics such as rhyme, alliteration and metric design, can be experienced as something between music and language. If a short audio recording of speech is repeatedly listened to many times, it starts to sound like singing (BRANDT ET AL. 2012).

Music and speech have copious common characteristics: they are both made up of complex auditory signals which are based on the same acoustic parameters (frequency, duration, intensity and pitch). Music and speech consist of several levels of organization. Language consists of phonology, morphology, syntax, semantics and pragmatics while music consists of rhythm, melody and harmony (CHOBERT & BESSON, 2013). There exists an overlap of nervous regions during the processing of music and language. Furthermore, both types of stimuli activate the bilateral frontal-temporal network (Merrill et al., 2012 as cited in BRANDT ET AL. 2012). The perception of temporal change from 25 to 50 ms is of great importance for receiving segmental and phonological information of speech signals, as well as for differentiating music instruments. The same temporal activity (rapid temporal processing) is needed for processing musical and linguistic pitch.

The current separation of music and language was caused by numerous factors. According to Wilson (2012 as cited in BRANDT ET AL. 2012) the acquisition of language is fast and mostly autonomous, while acquisition of music is slower and is dependent on intensive learning and practice. Brandt et al. do not agree with such an assertion and believe that it was made because of a mistaken approach towards certain aspects of these phenomena. Namely, language skills are usually measured in comparison with the adult population as a whole, while musical skills are measured in comparison to professional musicians, which creates a false picture in which learning music is more complicated and time consuming. Another factor which contributes to the separated view of music and language is the mistaken belief that explicit music education is needed for music acquisition, unlike language acquisition.

Brandt et al. (2012) believe that language is presented to children as a vocal performance, and that children first deal with the musical aspects of speech. Without the ability to listen musically it would be impossible to learn to speak. The authors introduce a detailed developmental scheme of these two phenomena where they defend the aforementioned claim (for a more detailed discussion cf. BRANDT ET AL. 2012). The development of music and language abilities occurs in a relatively even pace throughout childhood, even though musical development, especially in Western cultures, receives less attention. This again indicates that musical development is not less inborn than language development (BRANDT ET AL. 2012).

2. Empirical research in the field

The influence of music on language acquisition became a popular research topic after the demonstration of the Mozart effect (DELOGU ET AL. 2009) as well as the popularity of Gardner’s multiple intelligence theory (ĐORĐEVIĆ, 2011).

Dolman and Spring (2014) as well as Pretz and Schellenberg (2007) stress the importance of clearly defining whether the research deals with musicality, musical experience or musical ability. This distinction needs to be made for studies to be comparable. Schellenberg and Weiss (2013) list a number of tests for measuring musical ability (Seashore, Musical Aptitude Profile, Primary Measures of Music Audiation, Wing’s Musical Aptitude Test) which can be used in this type of research. However, a test which could be used as a “golden” standard does not exist. Various tests are used in studies, resulting in the accumulation of results difficult for comparison.

The influence of music on language acquisition is a broad concept, therefore researchers need to narrow down the field of inquiry. Most studies explore the influence of music (ability, experience, musicality) on the acquisition of phonological elements, i.e. processing and production of speech, while a much smaller number of studies focuses on the acquisition of reading skills.

Language structures consist of two types of phonological information: segmental and supra-segmental (CHOBERT & BESSON, 2013). Segmental type of information refers to the acoustic characteristics of speech, differentiates phonemes and is used to convey differences between words. For example “bag” and “gag” which differ in one consonant which changes the phoneme and the meaning of the word. Supra-segmental refers to acoustic characteristics of a number of segments, e.g. accent or prosody. Pitch in tone languages, such as Mandarin Chinese, Thai or most African languages, belongs to the supra-segmental group of elements (CHOBERT & BESSON, 2013).

Slavic and Miyake (2006) studied the influence of high musical abilities on the development of language skills: phonological perception, phonological production, syntax and lexical knowledge in a foreign language. The subjects were adults from Japan, who moved to the USA after they had reached the age of eleven. Musical abilities were tested using the Wing Measures of Musical Talents subtest (Wing, 1968 as cited in DOLMAN & SPRING, 2014). In the phonological perception and production tests the phonemes /l/ and /r/ were tested. In the Japanese language the equivalent for these phonemes does not exist. The results showed that learners with high musical ability had better results in phonological production and perception tests, while there was no difference in the syntax and lexical knowledge tests. The aspect of this study problematic for comparison, is the fact that the subjects were adults, who had been living in an English speaking country, hence the comparison with students who are exposed to the foreign language only in formal education is not optimal (DOLMAN & SPRING, 2014).

Milanov (2010) study was conducted with students whose mother tongue was Finnish. They were divided into three groups: choir members, English language major students and non-musical students. All of the participants were given the Seashore musical ability test. The perception and production of English phonemes, which do not have an equivalent in Finnish, was tested. The results indicated that the participants with higher musical abilities achieved better results on both tests (MILANOV, 2011).

In comparison with the aforementioned studies, Dolman and Spring (2014) went one step further and explored which part of musical ability influences the achievement of better results in phonetic production tests. Seashore music test consists of six subtests: pitch, duration, timbre, rhythm, volume and tone memory. The researchers statistically analyzed the results of the phonetic perception and production tests in comparison to each Seashore subtest. The subjects were Japanese students who were at the same level of English language knowledge. The tested phonemes have no equivalent in Japanese: /l/, /r/, /⁰/ and /^ø/ as well as some phonemes which have an equivalent, but which are difficult to pronounce /f/, /n/ and /v/. Differences in the phonetic production and perception tests occurred only in participants who had better results in the duration i.e. temporal subtest and only for the phonemes /l/ and /r/. Because of such different results certain questions arise: Do the differences in music skills need to be large? (as in the study Milanov 2010 where the difference is made between students who study music and those who do not). Would the results have been different if the variations in skill had been greater? In the Dolman and Spring (2014) research all of the participants had relatively high scores and the variations were not large. Another question which is frequently posed in such studies is: How much do similarities and differences between languages influence the reach results?

Marie et al. (2011) tested the influence of music experience on tone differentiation (supra-segmental) and differentiating variations of consonants and vowels (segmental) in Mandarin Chinese. The participants in the study were musicians and non-musicians whose mother tongue was French and who had never had contact with Chinese. Musicians achieved better results on both tests. Moreover, an ERP analyses was conducted, the results of which showed that the differences in tones were categorized faster by musicians. The research at hand differs from the aforementioned

studies because it deals with the influence of music experience on the acquisition of foreign language phonetics (CHOBERT & BESSON, 2013).

Sadakata and Sekiyama (2011) conducted a research with two groups of subjects. The first group consisted of subjects whose mother tongue was Japanese, and the second group consisted of subjects whose mother tongue was Dutch. In the first group, the recognition and differentiation of vowels in the Dutch language was tested, while in the second group, the recognition and differentiation of *mora* in the Japanese language was tested. This research also explores the influence of music experience. The participants were divided into two groups based on whether they were musicians or not. Musicians achieved better results on consonant variation recognition and differentiation tests (CHOBERT & BESSON, 2013)

Delogue et al. (2009) present their research, conducted in 2006, where a positive correlation between higher musical ability and pronunciation in a foreign language does not occur. The authors conducted two experiments in which they explore the influence of musical ability on the perception of consonant length and recognition of various phonemes in a foreign language (Chinese). In the first experiment the subjects were children and in the second adults. The subjects' mother tongue was Italian. Adults were divided into three groups – “naïve” without music experience, Chinese language majors and professional musicians. All of the participants did the musical ability test Standardized Test of Musical Intelligence (Wing, 1948 as cited in DELOGU ET AL. 2009). Results indicated that higher musical ability had a positive influence on the perception of vowel length, but had no influence on phoneme recognition. However, it must be taken into consideration that the authors used phonemes which have equivalents in both languages, which is not typical for this type of research. When there is no linguistic categorization of phonemes subjects use musical categorization based on their musical characteristics. For this reason phonemes which do *not* have an equivalent are used. Children were divided into three groups depending on musical ability test results, and the results were the same as for the adult groups.

Even though the first three listed studies (SLAVIC & MIYAKE, 2006; MILANOV, 2010; DOLAMN & SPRING, 2014) explore the influence of musical ability they are significant for this research because they focus on the acquisition of segmental elements, the acquisition of phonemes. In other words, they focus on the acquisition of the same elements as the study at hand. Milanov (2010) is important because one of the research groups consisted of choir members, while the Domlan and Spring (2014) research is important because of the instrument and methodology which were used as models for this study. Marie et al. (2011) and Sadakata & Sekiyama (2011) are significant because they explore the influence of musical experience on the acquisition of segmental elements. On the other hand, Delogue et al. (2009) research is important because the positive correlation between higher musical ability and segmental element acquisition does not occur.

3. Interpretation of the connection between music and language

Chobert and Besson (2013) propose 4 possible explanations for the positive effect that music has on the production of sounds in the mother tongue and foreign languages.

1. At the neurological level, Patel (2008) considers that the processing of the acoustic characteristics of music and language is based on the same processes. This is the OPERA hypothesis, which is based on the idea that the plasticity caused by music practice is caused through the interaction of five basic elements:
 - a. The overlap of brain areas which process acoustic signals in music and speech sounds;
 - b. Preciseness which is higher in music practice than in speech;
 - c. Emotions, which are positive during music practice;
 - d. Repetition of music activity;
 - e. The focus and concentration during music practice;
2. Music practice demands that attention, control and memory be kept on a high level. Several authors indicated the importance of attention for successful language learning (Guion & Pederson, 2007; Segalowitz, 1997 as cited in CHOBERT & BESSON, 2013), various research results showed that musicians have a higher auditory attention in comparison to

people who are not musicians (Strait et al., 2010; Tervaniemi et al., 2009 as cited in CHOBERT & BESSON, 2013). Working memory is in strong correlation with vocabulary knowledge, grammar and pronunciation in a foreign language, therefore it plays a key role in foreign language learning. Musicians have a better working memory (Chan et al., 1998; Tierney et al., 2008 as cited in CHOBERT & BESSON, 2013). A positive correlation was found for music practice and verbal working memory (Brandler et al., 2003 as cited in CHOBERT & BESSON, 2013).

3. On the brain level, studies focusing on brain scans showed a higher activation of working memory during music activities in musicians in comparison to individuals who do not have such an extensive music experience (CHOBERT & BESSON, 2013). Several studies have shown that the same brain regions are activated during verbal and musical short-term memory (Brown & Martinez, 2007; Gordon et al., 2010; Onishi et al., 2001 as cited in CHOBERT & BESSON, 2013).

A disadvantage of the abovementioned explanations is the fact that they refer to positive effects of music on cognition in general, not on the effect of music on language acquisition.

4. Besson et al. (2004 as cited in CHOBERT & BESSON, 2013) proposed that a transfer of the positive effects of music practice could positively influence the specific aspects of speech processing, such as segmental and supra-segmental contrasts and prosody processing. In accordance with this interpretation, the available results indicate that music experience not only shapes the activity of brain structures needed for the processing of acoustic signals in speech, but also influences the activity of other brain regions which are active during phonological processing, in other words regions important for learning new speech contrasts (Golestani & Zatorre, 2004 as cited in CHOBERT & BESSON, 2013).

4. Problems in studies which focus on the influence of music on language acquisition

Schellenberg and Pretz (2007) list the four main problems in studies which research the influence of music on language acquisition.

1. It is problematic if a clear distinction is not made whether the influence of musical experience, musical ability or musicality is being explored. However, these two authors add that it is important to cover all three concepts because they are closely connected. If the influence of musical experience is explored, as is the case in many studies where a distinction between musician and non-musicians is made, a musical ability test needs to be conducted because it varies even in individuals with the same music experience.
2. Causality is not proven to a satisfactory extent in the studies conducted to this point in time.
3. Music experience has an influence on cognition in general which then influence language. However, it is problematic to determine a direct link between language and music.
4. Modularity of language and music presents the last problematic issue on this list.

5. Method

The research was conducted at the Preschool Teacher Training College *Mihailo Palov* in Vrsac and is a case study.

The research problem is based on the question: Does the students' music experience influence their acquisition of phonemes in a foreign language – English language?

The goal of the research is to explore the influence of the students' musical experience on the acquisition of phonemes in English which do not have an equivalent in Serbian.

In order to achieve the defined research goal the following research tasks needed to be fulfilled:

1. Determine the students' language experience.
2. Determine the students' music experience.

General hypothesis:

GH – It is assumed that all students who are choir members have a higher level of musical ability, but differ in the level of music experience.

Specific hypotheses:

H1 – It is assumed that students with the least music experience, i.e. the first year students, will have lower results on the pronunciation test than second and third year students.

H2 – It is assumed that second year students will have lower results on the phoneme pronunciation test than the third year students who have the most music experience.

Research subjects

The research subjects are first, second and third year students at the Preschool Teacher Training College *Mihailo Palov* in Vrsac (N=35). In the college study program the students learn English in foreign language courses only during the first year of study. The courses are mandatory and cover the B1 level. A wide array of music subjects are available to the students during all three years. The mandatory music subjects are: vocal-instrumental practicum, vocal-instrumental practicum 2 and music teaching methodology. Choir is available as a selective subject during all three years of study. During the vocal-instrumental practicum course all students learn to play the piano with both hand and sing songs. On the basis of the aforementioned facts it can be concluded that considerable music experience and knowledge is gained during every year of study at the college. All of the students who participated in the study were members of the Preschool Teacher Training College *Mihailo Palov* choir. For a student to become a part of the choir they need to pass a music ability test which is conducted by the music teachers who work at the college.

Methods, techniques and research instruments

The questionnaire and test techniques were used in the research. The instrument was a questionnaire and a phoneme production test. The questionnaire and the pronunciation test were conducted on different days. The questionnaire was implemented with the aim of acquiring information about the students' language and music experience. It consisted of 9 questions. Questions from 1 to 4 referred to the students' language experience and were implemented to gather the following data: a. Have all of the students been learning the English language for the same period of time? b. Have any of the students actively attended private foreign language courses? c. Have any of the students spent more than a month in an English speaking country? d. Are any of the students bilingual? The questions from 5 to 9 referred to the students' music experience and were implemented to collect the following data: a. Are the students members of any other choirs apart from the Preschool Teacher Training College choir? b. Were they a member of any other choirs and for how long? c. Do they play a music instrument? e. Have they completed elementary music school and/ or music high school?

Since pronunciation is a wide concept, segmental elements of pronunciation were explored in this research. The production of phonemes /^θ/ and /^ð/, which do not have equivalents in the Serbian language, was tested. The research instrument was taken and adapted from Dolman & Spring, 2014. Consent was received for the usage and modification of the test so that it would satisfy the needs of this particular research. The pronunciation test implemented in this research consisted of 14 words, from which 10 (Bath, Bathe, Mother, Smooth, These, Thick, Think, Though, Thumb, Youth) were used to test the pronunciation of phonemes /^θ/ and /^ð/ while 4 words (Beef, Fought, Often, Radar), which were originally used for the testing of phonemes /f/ and /r/, were used

as distractors. The word order was changed during the testing. The students were told that they will listen to a certain number of recorded words and that their task is to repeat the word. The examiner encouraged the students to try to repeat the words even if the words were unknown. The students were tested individually and their answers were taped. After each word the recording was paused so that sufficient time would be given for the students to repeat the word. Two native speakers of English graded the students' pronunciation on a scale from 1 to 5 (starting from 1 – the word is unrecognizable to 5 – the word was pronounced perfectly). The native speaker results were added and the average score was used in the results analysis.

6. Results and discussion

Questionnaire

On the basis of the questionnaire data, it was concluded that all students who participated in the research started learning the English language as a foreign language during the fifth year of elementary school and that none of the students are bilingual. One of the students spent more than a year in a foreign country where English is the official language, hence her results were not considered in the final data analysis. None of the students attended intensive private English language courses.

The following results were gathered regarding the students music experience. None of the students were members of any other choirs apart from the Preschool Teacher Training College *Mihailo Palov* choir at the time. None of the students finished elementary music school and music high school. A complication occurred regarding the previous music experience of the students. Namely, 14 students did not have any previous music experience while 21 of the students had four years of music experience in a choir – during the higher grades of elementary school or during high school. Divided according to year of study the situation is as follows:

I year – 6 students without previous experience in a choir, 7 students with experience;

II year – 3 students without previous experience in a choir, 8 students with experience;

III year – 5 students without previous experience in a choir, 6 students with experience;

Pronunciation test (production of phonemes)

The pronunciation test was graded by two native speakers of the English language, their grades were added and the average value was used in the research analysis. The total success rate of students was percentually presented. Because of the differences in the students music experience two data analysis were conducted:

- a. The total success rate on the pronunciation test of phonemes /ð/ and /θ/ was calculated for students of each year (Table 1);
- b. The total success rate on the pronunciation test of phonemes /ð/ and /θ/ was calculated for students with previous music experience and without it, for each year of study separately (Table 2);

Through this analysis the influence of music experience on the pronunciation of phonemes /ð/ and /θ/ will be checked twice - in the first analysis the influence of music experience gained at the college, in the second the influence of the previous choir experience gained in elementary school or high school.

From the total success rate per year of study (Table 1) it can be seen that the success rate rises with every year. The difference in success rate of 4.21% between the first and second year is considerably larger than the difference between the second and third year of study which is 0.82%. This difference can be explained by the fact that the largest amount of practical music experience is gained during the second year of study, while learning to play the piano with both hands and sing simultaneously. During the first and third year, music courses, apart from the choir courses, focus more on the theoretical aspect of music. Hence, the difference in music experience is greater between the first and second year students than between the second and third year students. With this the first hypothesis is confirmed that the students with the least music experience, i.e. the first year students, will have lower results on the pronunciation test than the students of the second and third year.

Table 1: Total success rate on the pronunciation test per year of study

Total success rate on the pronunciation test	
I year	73.69%
II year	77.90%
III year	78.72%

When the total success rate is viewed in comparison to the previous choir experience divided according to year of study (Table 2) the influence of music experience on the subjects' pronunciation can again be seen. The difference between the results of students with and without previous choir experience decreased in the second and third year of study, i.e. as the amount of music experience gained at the college increases. The difference between the students with and without previous choir experience for the first year is 5.31%, for the second year 4.48% and for the third year is 2.43%. With these results the second hypothesis was confirmed that the second year students will have worse results than the third year students who have the most music experience. Furthermore, these results present additional confirmation that music experience influences the pronunciation of phonemes which do not have an equivalent in the mother tongue.

Table 2: Total success rate on the pronunciation test divided according to previous choir experience and year of study

	Success rate of students with previous experience	Success rate of students without previous experience
I year	76.14%	70.83%
II year	79.12%	74.66%
III year	79.83%	77.40%

On the basis of the data analysis it can be concluded that the general hypothesis that musical experience positively influenced the acquisition of phonemes /^o/ and /^θ/, in this group of students, is confirmed.

7. Conclusion

In the research of the influence of music on the acquisition of foreign language phonetics two main currents can be noticed. The first focuses on the research of segmental elements while the second one focuses on the research of supra-segmental elements. The research presented in this paper belongs to the first current. In the previous research in the first current the focus has mainly been placed on the influence of music ability on the acquisition of segmental elements. However, in this study the influence of music experience on the acquisition of segmental pronunciation elements in a foreign language is explored. It should be noted that musical ability was not disregarded since all of the students who participated in the study had passed a musical ability test before being accepted into the choir.

In this field of research the need to conduct research with various languages is stressed (DOLMAN & SPRING, 2014; BRENDT ET AL. 2012; MILANOV, 2009; CHOBERT & BESSON, 2013). The reason behind such a need is the fact that language characteristics may influence the extent to which music influences the acquisition of language elements. Moreover, the topology between languages (native and foreign which is being studied) can also influence the extent to which music influences the acquisition of foreign language elements. In the previous studies explored in this paper the researched languages were: English, Finnish, Chinese, Japanese and Italian, This research is significant because the subjects are native speakers of the Serbian language.

Since the research in this paper is a case study with a limited number of participants broad generalizations cannot be made. However, this research offers insight into the influence of music experience on the acquisition of segmental elements of English as a foreign language with students whose mother tongue is Serbian. In other words it offers insight into the connection between two languages which have not been explored earlier in this context. In further research it would be preferable if a larger study could be implemented with a larger number of participants so that a more detailed statistical analysis could be conducted. Furthermore, there is a need for studies of the

influence of music experience and music ability on the acquisition of supra-segmental foreign language elements with students whose mother tongue is Serbian. The need for the inclusion of various languages in this field of research still stands and will also be repeated here.

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