

SUCCESS RATE OF CZECH STUDENTS' PERFORMANCES IN LANGUAGE MEMORY TEST

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Abstract

This article, originating from the Faculty of Education at the University of Hradec Králové, investigates auditory linguistic memory and attitudes toward foreign language learning among Czech primary and lower-secondary school students. Utilizing a quasi-experimental design featuring recordings of 10 different languages, the study aimed to measure the efficacy of auditory memory in language recognition and gauge student attitudes. While a generally positive disposition toward learning foreign languages was observed, the data did not support the hypothesis that prior music education enhances language recognition abilities. The findings suggest a nuanced relationship between musical training and language learning, opening up new considerations for educational strategies in foreign language instruction.

Keywords

Linguistic memory; Foreign language; The role of music; Primary and secondary education.

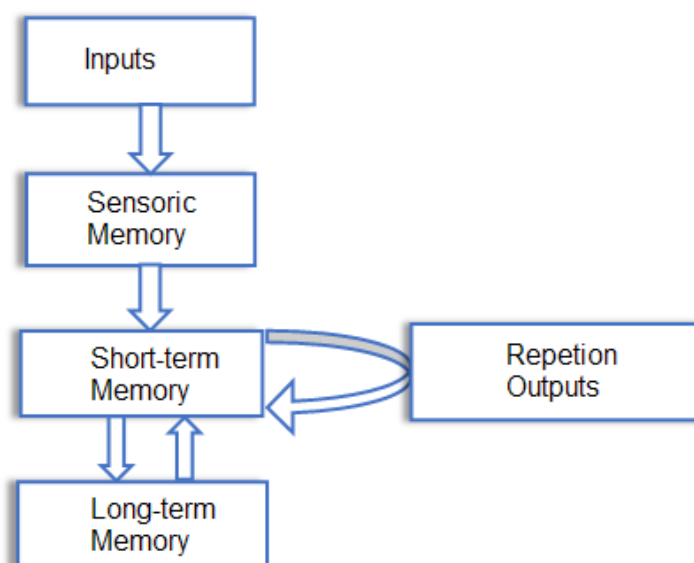
Introduction

Memory belongs to basic cognitive processes which make human beings able to store, preserve and process structured information. Memory can be viewed from several possible angles. Hort & Rusina [1], Patel [2], Turker & Reiterer et al. [3], Friederici [4], Besedova & Vyšata et al. [5] take the neurological point of view and claim that memory is an ability of animate beings to store and recall information in their central nervous system. From the psychological point of view, memory can be defined as a type of means by which we recall our past experience in order to use this acquired information at the present time [6], [7]. From the pedagogical point of view, memory is a set of mental processes enabling to store, preserve and recall perceptions, knowledge, movements and experience [8], [9], [10]. Thus, memory is a human tool associated with cognition, learning and re-calling. All these processes are essential when foreign languages are acquired. The following principal memory mechanisms are mentioned in all memory definitions: coding, storage (retention) and recalling.

There are very diverse approaches to the classification of memory types. The authors of various classifications usually approach memory from the perspective of their specialization. For example, memory can be subdivided into the following types: visual, auditory, tactile, gustatory and olfactory. Furthermore, depending on the expected retention time of the memory record, there are three types - short-term, medium-term and long-term memory. Neurologists distinguish declarative and non-declarative memory, or explicit and implicit memory, or direct and indirect memory. The neurological point of view and the time point of

view were those mainly considered in our research into memory. According to Koukolík [11], who mentions Baddeley [12] and who views memory neuropsychologically, a model of working memory consists of three components: the phonological loop, the visuo-spatial sketch pad and the central executive. The first component, i.e. the phonological loop, was essential for our research. It is a system in which audio information of the non-speech and speech characters is stored. According to Koukolík [11], Steinbeis & Koelsch [13], Jäncke [14], Habibi et al. [15], and others, this information is lost within two or three seconds if it is not repeated. Thus, the phonological loop working with phonological and audio information is essential for both the mother tongue and foreign languages. That is why this component of memory plays an important role in foreign language learning. According to Baddeley [12] or Skarnitzl et al. [16], the existence of the phonological loop is evidently proved by phenomena such as the effects of phonological similarity, those of the word length and of articulatory suppression, the transfer of information between systems, and the existence of other numerous neuropsychological phenomena. Audio items included in the phonological loop are much more difficult to remember. In this case, it is appropriate to demand loud irrelevant speech production, which is essential for teaching foreign languages. This speech production should be active when learning new words or phrases since that the newly acquired information is stored in the short-term and later in the long-term memory.

The time aspect is another factor related to memory. Sternberg [6] lists the following types of memory - sensory memory, short-term memory and long-term memory. This memory model was designed in the 1960s by R. Atkinson and R. Shiffrin [17] and can be illustrated in Figure 1.



Source: Own adaptation of [17]

Fig. 1: Memory model by R. Atkinson and R. Shiffrin [17]

Sensory memory, also known as immediate or iconic memory, mainly uses auditory and visual code; the memory trace is stored for about two seconds. Sensory memory refers to the amount of information that we are able to retain in our consciousness without active learning. It can have a large capacity and it is adapted to the perception of different sensory modalities, e.g. visual memory and acoustic memory, movement memory and others.

There are some terminological ambiguities related to short-term memory (which is also called recent memory or working memory). It is the active part of memory and is used to store

information for a few seconds, occasionally for a few minutes. Short-term memory is temporary, and it stores the information which is not stored in long-term memory. In our research, short-term memory was essential in the listening test – the respondents were supposed to retain audio information (the melody of an unknown language) for several minutes. Cognitive psychologists subdivide this type of memory into immediate memory and working memory. In immediate memory, storing of information is impacted by our current attention and current flow of thoughts. The capacity of immediate memory is quite limited, but dependent on the type of the stored information. G. A. Miller in his article “The magical number seven, plus or minus two: Some limits on our capacity for processing information” [18] which was published in 1956 in *Psychological Review*, characterizes this immediate memory with the number ± 7 . We were inspired by Miller’s law when choosing the number of foreign language recordings to be included in our listening test, see the methodology chapter 1.2.

The third type of memory is long-term memory (reference memory), which is the most complex type of memory. Its main function is to store and organize long-known information into complex networks, to connect new knowledge with that which has been already acquired. According to Mareš [19], this type of memory represents a sophisticated archive from which information is quickly retrieved when needed. Mareš also claims that a single universal long-term memory does not seem to exist. The ability to keep any information in the memory for a longer period of time and then to recall it is essentially important in case of school children. As Vágnerová in [20] mentions, memory functions, which are a prerequisite for learning, develop very intensively between 6–12 years of age. This development depends not only on the maturation process, but also on specific stimulations and requirements imposed by school. The development of children's memory is manifested by an increase in its capacity, the speed of information processing, the acquisition and more effective use of memory strategies, and the development of general knowledge about how memory works. This fact was also essential for our research, the participants in which were individuals aged 9–12, i.e. children of younger school age. This age is also very important for the development of language and foreign language skills. In this phase of the child’s development, the first systematic learning of a foreign language occurs (our attention is focused only on teaching foreign languages, thus no other systematic types of learning are mentioned). In the initial phase of foreign language teaching, the suprasegmental level of language plays an important role, so the perception of melody, rhythm and intonation are essential in this phase of the teaching and learning processes.

When a foreign language utterance is perceived, memory plays a fundamental role. This relationship between memory and a foreign language acquisition can be characterized as inseparable. At this point, it is important to mention the issue of interconnectedness between the (foreign) language and music, and the fact that individuals systematically trained in music learn foreign languages more easily due to their increased sensitivity for speech intonation and its metric characteristics. A number of research studies have been already carried out in this field [5], [10], [21], [22], [23], [24]. They have proved the existing similarity of memorizing in the process of acquiring a foreign language and in the process of practicing music. A close connection between music and languages can be seen from several points of view; these points of view interact with and complete each other. The following aspects are similarly perceived by Sedlák and Váňová [25]:

1. *The ontogenetic aspect – both music and speech are human beings’ ways of communicating through sounds.*
2. *The neurological aspect – the cooperation of the cognitive structures required for music and language is evident. Intonation, rhythm and other kinetic*

components of music create a connection between the processing of music in the right hemisphere of the brain and the processing of verbal information in the left hemisphere. This means that the brain engages both hemispheres simultaneously, blurring the distinctions mentioned in the traditional dichotomous view of the brain functions.

3. *The phonetic aspect – sounds are essential both in music and in languages.*
4. *The pedagogical aspect – the similarity between music and language can be used in both directions, for example new kinds of music-linguistic techniques can come into being.*

1 Research Focus

The mutual influence of music and language was one of our researched issues since we believe that memory training given to individuals being trained in music is beneficial for the sphere of teaching and learning of foreign languages. This relates mainly to the melody and intonation which are specific for the target foreign language. This assumption of ours was to be confirmed or disproved when verifying our hypotheses.

Memory is involved in all mental abilities and it is the key factor in the learning process, in which the human brain transfers current experience into a code (there is as an information transfer into a code of the memory system). Thus, memory is ability absolutely essential for formation of any foreign language experience. The role of memory in learning of foreign languages includes a wide range of interdisciplinary issues from the spheres of linguistics, music, education, medicine, technology and others. At this point we can mention long-term memory involved in long-term storing and remembering of a foreign language text; and we can also mention short-term memory involved in short-term remembering of vocabulary or phrases. The development of foreign language memory is also associated with experience and practice – an intensive contact with a foreign language and constant repetition of foreign language structures are definitely helpful. The degree of effectiveness of recalling foreign language information is therefore directly proportional to the degree of repetition of the given information and its practical use.

1.1 Research Objectives and Research Questions

The main objectives of our research were to reveal the success rate of the passive auditory language memory in learners attending educational institutions of the primary and lower secondary levels, and to map these learners' attitude to foreign language learning. The following research questions were asked:

1. Which attitude to foreign language learning is taken by the 4th / 5th grade pupils and which attitude to foreign language learning is taken by the 7th grade pupils?
2. What is the success rate in the language memory test reached by the 4th / 5th grade pupils and the 7th grade pupils?
3. Are pupils who have been trained in music (in music schools) more successful in recognition of foreign languages than pupils who have not been trained in music?
4. Does the gender difference play a significant role in remembering foreign languages?

Based on the objectives of our research, we formulated a set of following hypotheses to be confirmed or disproved.

H1: The 7th grade pupils have a more positive attitude to learning of foreign languages than the 4th / 5th grade pupils.

- H2: The 7th grade pupils are more successful in the language memory test than the 4th / 5th grade pupils.
- H3: The 7th grade pupils having been trained in music are more successful in the language memory test than the 7th grade pupils not having been trained in music.
- H4: The 4th / 5th grade pupils having been trained in music are more successful in the language memory test than the 4th / 5th grade pupils not having been trained in music.
- H5: The 7th grade pupils having attended music school are more successful in the language memory test than the 4th / 5th grade pupils having attended music school.
- H6: The 7th grade pupils not having attended music school are more successful in the language memory test than the 4th / 5th grade pupils not having attended music school.
- H7: There is no significant difference in the results reached in the language memory test by the 4th / 5th and 7th grade males and by the 4th / 5th and 7th grade females.

1.2 Research Methodology

1.2.1 General Background

The research was carried out in the Czech Republic, at the Faculty of Education of the University of Hradec Králové. Its main objective was to reveal how successful the respondents are in the language memory test. A combined research method was chosen, consisting of a quasi-experiment (a listening test) and a questionnaire survey.

1.2.2 Respondents

The research sample consisted of the total number of 274 respondents. All of them had been taught English since their first school year. 145 respondents were of the age 9–10 (the 4th and 5th graders of a primary school in Hradec Králové); 42 respondents out of this number had been attending music school, see Table 1.

Tab. 1: Respondents from the fourth and fifth year

Respondents	4 th year	5 th year	Attendees of (primary) art school
Girls	43	43	35
Boys	28	31	7
Total	71	74	42

Source: Own

129 respondents were of the age of 12 (students of lower secondary schools in the region of Hradec Králové and that of Vysočina; in this text they are referred to as the 7th grade pupils / the 7th graders); 44 respondents out of this number had been attending music school, see Table 2.

Tab. 2: Respondents from the seventh year

Respondents	7 th year	Attendees of (primary) art school
Girls	73	31
Boys	56	13
Total	129	44

Source: Own

The research and data processing were carried out in accordance with the basic ethical principles. The research was approved by Ethical Commission of the Faculty of Education of University Hradec Králové on 22nd January 2019. The respondents were provided with

detailed information about the research. The respondents' legal representatives' informed consent was provided after they were informed about the research contents, objectives and process, and after they were assured of maintaining anonymity and confidentiality. The respondents themselves were also provided with detailed information about the research.

1.2.3 Tools and Procedures

In the preparatory phase of our quasi-experiment, a language-friendly text was prepared in the form of an audio recording. The listening text consisted of merely simple sentences related to a common social situation (one person is introducing their friend Vanda). The name "Vanda" was intentionally used since its pronunciation is universal, and this name is typical of none of the presented languages. It was decided that the text should be approximately 30 seconds long and that it would include neutral sentences and only basic grammar phenomena. The following text was translated into the languages to be tested; native speakers were being recorded when reading the appropriate language versions:

Good morning. How are you? Could I introduce my friend Vanda to you? She is twenty-two, and at the time being she is studying psychology at our university. Vanda is a very nice, pretty, witty and intelligent girl and is interested in a lot of things. She is fond of and very good at sports. Vanda, can you come to us, please?

The so-called raw recordings of the languages were made with different recording devices in different formats and in most cases in acoustically unsuitable conditions. Thus, the first task was to unify all recordings into a single format for subsequent processing by editing programs. All the formatting operations were carried out at an editing workstation equipped with professional Steinberg Cubase and Acoustica programs, with an external Lexicon Lambda sound card, a SoundCraft GB2R–12/2 mixing desk, a professional Zoom F8 eight-track recording and with RCF NX10–SMA coaxial listening monitors for listening in the so-called close field. The listening to the final recordings was done through headphones because classrooms are usually not equipped with adequate spatial acoustics or adequate reproduction devices. All recordings were transformed to a monophonic version and normalized to –18 dBFS level for subsequent editing. All the recordings were sub-grouped according to the language families and language groups they belonged to. Since all the recordings were separate files, any listening and/or test sequences could be created.

A listening test consisting of selected language sequences was a key tool in the quasi-experiment. It was applied to detect the respondents' passive language memory (recognition). The 7th graders (aged 12) were played thirty-second-long audio sequences of individual languages. The 4th / 5th graders (aged from 9 to 10) were played shortened audio sequences (fifteen-second-long) since they are not able to concentrate so long. Referring to their previous experience, the respondents were assigned to recognize / identify the foreign languages played to them. The respondents first listened to examples of ten foreign languages. During this listening process, they were being informed about which language was being played at that particular time. This first listening process was followed by listening to one of the two selected sequences of five languages (see Table 3). Each respondent expressed their personal view related to five selected foreign languages. The respondents' tasks were to recognize (identify) the type of the recorded foreign language and enter the answer into the answer sheets. Six Indo-European (Swedish, Danish, Spanish, Portuguese, Russian and Slovenian), one Altaic language (Turkish), one Uralic (Finnish), one Sino-Tibetan (Chinese) and one Austro-Asian language (Vietnamese) were included in the test given to the 4th and 5th graders. The results of our pilot research [26], [27] showed that Indo-European languages are perceived by young learners more positively than languages outside this language group. Therefore, Indo-European languages were represented at a larger extent in the test given to the

younger group. A wider scope of languages was included in the test for the 7th graders. Apart from Indo-European languages, also an Austronesian language (Malay language) and Japanese was included.

Tab. 3: *Overview of listening language tests*

Number of language sequences	Overview of used language sequence in pupils of 4th/5th year, sequence length 15 seconds		Listening / memory detection
Listening of ten samples	Swedish, Danish, Spanish, Portuguese, Russian, Slovenian, Turkish, Finnish, Chinese, Vietnamese		Respondents had been informed about the language types
Sequence of five samples in two variants	Turkish, Russian, Swedish, Vietnamese, Spanish	Danish, Turkish, Portuguese, Vietnamese, Slovenian	Respondents had not been informed about the language types
Number of language sequences	Overview of used language sequence in pupils of 7 th year, sequence length 30 seconds		Listening/memory detection
Listening of ten samples	Kazakh, Turkish, Malay, Vietnamese, Danish, Greek, Swedish, Japanese, Chinese, Finnish		Respondents had been informed about the language types
Sequence of five samples in two variants	Greek, Turkish, Chinese, Finnish, Vietnamese	Danish, Japanese, Kazakh, Swedish, Malay	Respondents had not been informed about the languages

Source: Own

The next phase of the research applied a non-standardized questionnaire to detect the respondents' attitude to music and foreign languages. The questionnaire contained polytomous multiple-choice items with Likert-type scales and the respondents completed it before the listening test itself.

1.2.4 Data Analysis

The data were pre-processed, cleaned and checked in the MS Excel program. Then they were exported into the statistical NCSS program. First of all, the detection of duplications was performed, the metric variables were verified in terms of range, i.e. it was verified whether the minimum and maximum correspond to the theoretically possible range of the monitored scales. Due to the fact that the data distribution was not of the fully standard character (the normality was tested by the Skewness test, Kurtosis test and Omnibus test), the non-parametric Mann-Whitney test was used for testing of the hypotheses.

2 Research Results

The main objective of the research was to reveal the success rate reached in the listening test by respondents attending primary and lower secondary schools, and to make findings about these respondents' attitude to foreign language learning. A sub-objective of the research was to investigate whether there is a significant difference in the passive language memory of the respondents who have been and who have not been systematically trained in music (i.e. who have and who have not attended music schools). The research also focused on the extent in which the gender difference impacts the monitored indicators.

2.1 Attitude to Foreign Languages

Before focusing on the respondents' language memory, the research team analyzed those answers in the questionnaire which were related to the respondents' attitude to foreign languages. The aim was to compare the results reached by the 4th / 5th graders with the results reached by the 7th graders. It had been assumed that the 7th graders (the lower secondary school students) have a more positive attitude towards learning foreign languages than the 4th / 5th graders (the primary school pupils). The rationale for this assumption can be found in the current position of foreign languages which is declared in documents related to the primary and secondary levels of education in the Czech Republic. The document essential for Czech schools is Development of Education [28]. Its ideas are further developed in Framework Educational Programme for Basic Education [29], which was published in 2007. Currently, English has the status of the first foreign language in Czech schools. English classes are compulsory from the third grade of primary schools; however, numerous schools offer English classes already in the first and second grades.

Doing research into the respondents' attitude to foreign languages, we used a seven-point scale; the scale of possible answers was from 1 to 7 (*I like it – I don't like it*). The semantic differential method was used for the data processing. Table 4 illustrates the results revealed in 4th / 5th graders (if there is no slash, the results of both these groups were identical).

Tab. 4: Relationship to foreign languages of pupils in 4th/5th year of Primary schools

Relationship to foreign languages	Average	Determinant deviation	Min.	Max.	Range	Median	Modus
Relationship to learning of foreign language	2.5 / 2.7	1.24 / 1.89	1	4 / 7	3 / 6	2	- / 2
Hours of foreign language	2.7 / 4.7	1.49 / 1.27	1 / 2	6 / 7	5 / 5	3 / 5	1 / 5
Relationship in total	5.2 / 7.4	2.27 / 2.50	2 / 3	9 / 13	7 / 10	5 / 6.5	- / 6

Source: Own

Table 5 illustrates the results revealed in the 7th graders.

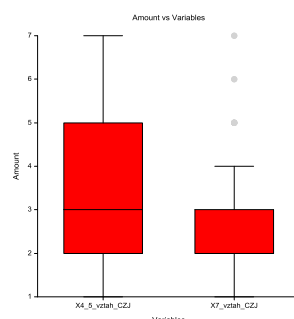
Tab. 5: Respondents from the seventh year

Relationship to foreign languages	Average	Determinant deviation	Min.	Max.	Range	Median	Modus
Relationship to learning of foreign language	2.7	1.32	1	7	6	3	2
Hours of foreign language	5.1	1.62	1	7	6	5	6
Relationship in total	7.8	2.30	2	14	12	8	8

Source: Own

In Czech schools (and similarly in schools in other countries), English is taught as the first foreign language. A positive attitude to English learning was revealed in all the respondents. We also wanted to find out whether there are any participants in our research who use a foreign language on the everyday life basis. In the 4th and 5th grade pupils' group there were 10 respondents using a foreign language in their everyday communication. These 10 respondents are bilingual. They are either of a different nationality (i.e. they are not Czech) or one of their parents is not Czech. Since bilingualism was not focused on in our research, there were no other questions or comments related to this issue.

Student's T-Test was used for testing. Due to the data characteristics (the data normality was not fully confirmed), the non-parametric Mann-Whitney test was used for testing the mean values. On the basis of the test results (T -Test: $p = 0.006194$; $t = 3.7807$; Mann-Whitney test: $\alpha = 0.05$; $p = 0.39719$; $Z = -2.7373$), our H1 hypothesis was confirmed (the group of 7th graders has a more positive attitude towards learning foreign languages than the 4th and 5th graders, see Figure 2).



Source: Own

Fig. 2: Relationship to learning of foreign language

The average results of the respondents rating their attitude to learning foreign languages were more or less identical; the values ranged from 2.5 to 2.7 (i.e. they were within the positive range on the seven-point rating scale). However, a more significant difference was noticed in the answers to the question asking about memorizing of song lyrics and about singing English songs in English classes. We had believed that songs are used more frequently in foreign language classes given to younger pupils since singing can increase learners' motivation for learning foreign languages. On the contrary, the results show that foreign language songs are implemented more frequently in foreign language classes given to the 7th graders than in classes given to the younger respondents (the value of 5.1). This result can be explained by the fact that the older respondents' knowledge of the foreign language is of a higher level, and so the listening comprehension skill is more trained in them than in the younger respondents. Our H1 Hypothesis was not confirmed.

2.2 Language Memory

One of the main objectives of our research was to reveal the respondents' level of passive language memory. The respondents' task was to identify 5 recordings made in different languages (Tables 6 and 7), see the methodology chapter 1.2.

Tab. 6: Language memory of pupils in 4th / 5th year

	Average	Determinant deviation	Min.	Max.	Range	Median	Modus
Success rate	0,38	0,21	0	1	1	0,4	0,4

Source: Own

Tab. 7: Language memory of pupils in 7th year

	Average	Determinant deviation	Min.	Max.	Range	Median	Modus
Success rate	0,22	0,21	0	0,8	0,8	0,2	0,2

Source: Own

The presented results show that the success rate in the younger respondents was 38% and the success rate in the older respondents was only 22%. The standard deviation showed a wide range for both groups of the respondents as well. Therefore, our H2 Hypothesis was not confirmed.

2.3 Language Memory in Pupils Being Trained in Music and Pupils not Being Trained in Music

Our next research issue was to find out whether the 4th / 5th graders having / not having been trained in music are or are not more successful in foreign language recognition than the 7th graders having / not having been trained in music.

Within the framework of previous research carried out at the Faculty of Education of the University of Hradec Králové, the success rate of the respondents aged 11–18 and attending music schools had been tested. It was revealed that the respondents having been systematically trained in music are more successful in recognizing foreign languages [30].

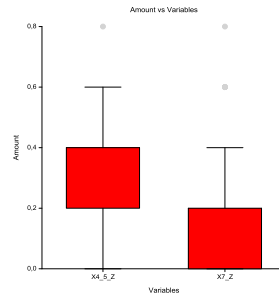
Our intention was to confirm / disprove the above-mentioned results through testing and comparing our respondents (the 4th / 5th graders and 7th graders). Student's *T*-Test was used for testing, and due to the nature of the data (the normality of the data was not fully confirmed), the non-parametric Mann-Whitney test was used for testing the mean values.

First, the differences between the respondents educated and non-educated in music were investigated within the same age category. Formulating our hypotheses, we drew upon the previous research results [30], which confirmed that individuals systematically trained in music have a higher memory capacity in the field of foreign languages than individuals not having been educated in music.

However, based on the results in the percentual success rate in the language memory test, there was not a statistically significant difference between the 7th graders having been trained in music and the 7th graders not having been trained in music (the *T*-Test: $p = 0.334452$; $t = 1.3917$; Mann-Whitney test: $\alpha = 0.05$; $Z = 0.9652$). In our research sample, out of 129 of the 7th graders, 44 have been systematically trained in music. The same result was detected also in 4th / 5th graders. Based on the results of the *T*-Test ($p = 0.942137$; $t = \text{test } 0.3700$) and Mann-Whitney test ($\alpha = 0.05$; $Z = 0.0726$), a statistically significant difference was not confirmed in the percentual success rate in the memory language test reached by the 4th and 5th graders in dependence on them being / not being trained in music. The average results of both the groups are comparable (32.8% in the respondents trained in music and 31.4% in the respondents not trained in music). The declared H3 and H4 Hypotheses cannot be confirmed. Thus, it cannot be claimed that individuals educated in music show a higher success rate in memory language tests in comparison with individuals not educated in music.

Similarly, H5 Hypothesis (the 7th graders having attended music school are more successful in the language memory test (the average was 24.1%) than the 4th / 5th graders having attended music school (the average was 32.9%)) was also not confirmed. *T*-Test results were: $p = 0.06426$; $t = \text{test } 1.6804$; Mann-Whitney test results were: $\alpha = 0.05$; $Z = 1.8504$.

On the contrary, there was a statistically significant difference in the results of the same tests, i.e. the *T*-Test ($p = 0.000004$; $t = 4.6200$), Mann-Whitney test ($\alpha = 0.05$; $Z = -4.6316$), reached by the 4th / 5th graders not having been trained in music (their success rate was 31.5% on average) and the results reached by the 7th graders also not having been trained in music education (18.8% on average), see Figure 3.



Source: Own

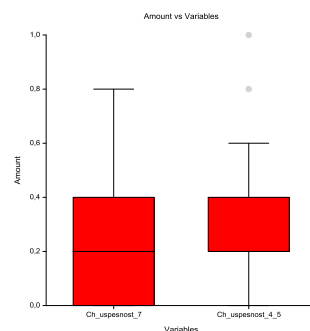
Fig. 3: Memory test of respondents who do not attend primary art school

Our H6 Hypothesis was not confirmed. However, this non-confirmation is not in conflict with the fact that the 4th and 5th graders were more successful than the 7th graders. As it was mentioned above, this outcome can be impacted by more factors, and these factors will be a subject of our further investigations.

2.4 Gender Differences Occurring in the Language Memory Test

An integral part of the research was to compare the gender differences related to the success rate in the language memory test. It was assumed that there is no significant difference in the results reached by the 4th / 5th and 7th grade boys and by the 4th / 5th and 7th grade girls (H7).

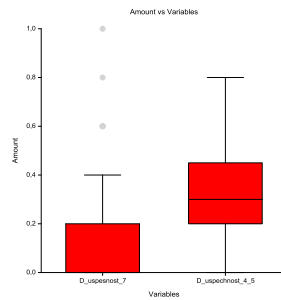
The success rate reached in the memory language test by the 7th grade boys and by the 4th / 5th grade boys was statistically analyzed, see Figure 4. A statistically significant difference was revealed by the *T*-Test ($p = 0.004261$; $t = -2.6231$) and by Mann-Whitney test ($\alpha = 0.05$; $Z = -2.8582$) in the success rate reached in the memory test by the 7th grade boys and the 4th / 5th grade boys. The 4th / 5th grade boys were more successful (the average of 32.2%, 59 respondents) than the 7th grade boys (the average of 22.1%, 56 respondents).



Source: Own

Fig. 4: Comparison of boys in 7th year and boys in 4th / 5th year in the memory test

The same indicator (the success rate reached in the memory language test) was monitored in the girls, see Figure 5. There was a statistically significant difference between the results reached by the 7th grade girls and the results reached by the 4th and 5th grade girls. The *T*-Test: $p = 0.000196$; $t = -3.5919$; Mann-Whitney test: $\alpha = 0.05$; $Z = -3.7241$). The 4th and 5th grade girls were more successful (the average of 31.9%, 86 respondents) than the 7th grade girls (the average of 19.5%, 73 respondents).

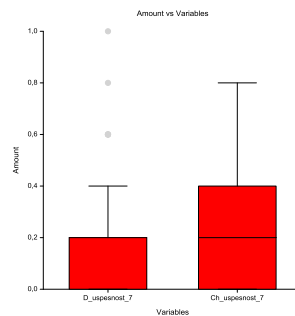


Source: Own

Fig. 5: Comparison of girls in 7th year and 4th /5th year in the memory test

The comparison of the results reached by different age groups within the same gender was considered to be interesting mainly from the psychological point of view. We had assumed that the observed differences would not be large, but we expected the older respondents to be more successful in the memory language tests due to their expected increased attentiveness and increased ability to concentrate [31]. However, this assumption was not confirmed.

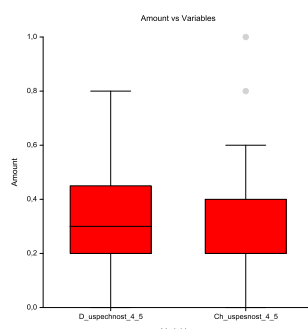
Our research also focused on the issue whether gender is reflected in the test results. It was assumed that there is no significant difference in the results reached in the language memory test by the 7th grade boys and girls and by the 4th / 5th grade and 7th grade girls (H7). The formulation of this hypothesis was based on the results of the research in 165 pupils aged from 12 to 14 [30], which revealed that the gender aspect does not play any important role in language memory tests. Our assumption was confirmed. There was no statistically significant difference between the female and male 7th graders in the percentual success rate in the language memory test (T -Test: $p = 0.486292$; $t = -0.7393$; Mann-Whitney test: $\alpha = 0.05$; $Z = 0.6962$), see Figure 6. The average results reached by both the groups of the respondents are balanced (19.5% in case of 73 female respondents; 22.1% in case of 56 male respondents).



Source: Own

Fig. 6: Comparison of girls in 7th year and boys in 7th year in the language memory test

The identical results were reached also by the female and male 4th / 5th graders and no statistically significant difference between the girls and boys was confirmed in their percentual success rate in the language memory test (T -Test: $p = 0.966142$; $t = -0.0846$; Mann-Whitney test: $\alpha = 0.05$; $Z = 0.0424$), see Figure 7.



Source: Own

Fig. 7: Comparison of girls in the 4th/5th year and boys in the 4th/5th year of primary school in the memory

The average results reached by both the groups of the respondents are comparable (31.9% in case of 86 female respondents; 32.2% in case of 59 male respondents). Thus, it cannot be claimed that girls are more successful in language memory tests, and neither can be claimed that boys are more successful in language memory tests.

Apart from H1 Hypothesis, which primarily dealt with the attitude to learning of foreign languages, all the other hypotheses are related to the process of recognition / identification of an unknown language. As it was mentioned earlier, a vast variety of psychological factors (interest, motivation, intelligence, subjective settings etc.) were involved in the process of doing the listening test and the subsequent identification of the languages, which brought an impact on the results of the research. It was not confirmed that pupils who have been systematically trained in music are more successful in the language memory test. However, the results obtained cannot be considered as generally valid due to a narrow scope of the research (only the factors of the passive language memory were monitored) and due to a lower number of the respondents.

Since a number of other factors enter into the auditory perception process and since these factors are not a subject of our research (we only monitored the foreign language recognition factor), at this stage of the investigation it is not possible to trustworthily answer the question why the established hypotheses were not confirmed.

3 Discussion

The presented research results are interesting, informative and beneficial, especially from the point of the methodology of foreign language teaching. Memory is currently one of the most frequently studied fields of cognitive processes. It is the key ability associated with all music and foreign language activities and associated with the continuity of music and foreign language awareness.

The research results partially confirmed our original assumption – respondents systematically trained in music are more successful in identification of unknown foreign languages than individuals not systematically trained in music. This can be explained by the fact that systematic practicing of melodies and rhythm in the sphere of the target music is beneficial also in the sphere of language learning. Referring to the methodology of foreign languages, this result calls for the implementation of music (in any form) into foreign language teaching at a greater extent because music increases the learners' sensitivity to the melody of the target language. However, the fact, that the 7th graders had worse results in the test than the 4th and 5th graders, is definitely an issue worth further investigating. In case of the 7th graders, their higher concentration on the given task was expected and it was also expected that they would profit from their longer practice in foreign languages. The fact that these older respondents

have reached their puberty age should be taken into consideration since this could impact their results in the test and their motivation to be successful in the test. On the contrary, the younger respondents got very involved in the tasks; they enjoyed working with headphones during the listening process and they were highly motivated to achieve good results.

The differences in the results achieved in the recognition of unknown languages by the girls and by the boys were negligible. In this respect, the gender of individual beings does not in any way disadvantage them in the process of recognizing of unknown foreign languages. It can be believed that the memory prerequisites for perceiving and learning foreign languages are the same for both the genders. Koukolík [32], Wan and Schlaug [33] or Trainor et al. [34] claim that neurobiological and gender differences between females and males are manifested in their brain's structural and functional connectivity during all life stages from childhood to the old age, especially in the sphere of memory, language, emotionality, etc. However, this opinion was not related to learning foreign languages. We agree with Koukolík [32] – females are better at speech production than males, and women's verbal memory is better than men's verbal memory. But this fact has no direct connection with our research into memory since our research focused on recognition, i.e. on passive memory. When establishing our hypotheses, we therefore assumed that gender differences in the language memory test which focused on the recognition of unknown foreign languages would not be statistically significant. And this assumption was confirmed. Thus, we believe that memory processes related to foreign languages do not disqualify either gender.

Our research was limited by a low number and insufficient diversity of the respondents. The selection of the schools from the region of Hradec Králové and that of Vysočina which got involved in the research depended on their willingness to participate in the research. There were other limiting factors in our research – a diversity of the research sample related to the number of years the students have been learning a foreign language (from 4 to 7 years), and the imbalance in the sample of the respondents associated with the number of those respondents who are educated in music schools. Other limits of the research can be seen in external impacts that could also affect the research itself. We were provided with sufficient space for our research in most school facilities, yet the research conditions were not identical. The obtained data could also be affected by the internal impacts - the respondents' conditions (i.e. their current mood, fatigue, etc.). We are fully aware of these issues, but they have not been sufficiently sorted out so far. Despite all the limitations of the research mentioned above, our research can be considered as highly stimulating and the resulting ideas and conclusion which are based on methodology and a system of classified knowledge can be considered beneficial.

Conclusion

The short-term auditory memory is limited in its capacity, and its duration is limited to merely several minutes. Auditory memory plays a significant role in the process of learning foreign languages and in the process of music learning. Thus, certain parallels can be found in these two learning processes, and these parallels are pointed out in our article.

The article presents the key results of the research whose main objectives were to reveal the level of the passive auditory language memory in learners attending educational institutions of the primary and secondary levels, and to map these learners' attitude to music and foreign language learning. The research also focused on the issue whether learners already educated in music are more successful in recognition / identification of foreign languages than learners not previously trained in music.

The research revealed that a positive attitude to learning foreign languages prevails in the majority of the respondents. The hypothesis claiming that the 7th graders' attitude to learning foreign languages is more positive than the 4th and 5th graders' attitude was confirmed, even though the younger group also declared their positive attitude to learning foreign languages. These findings can be considered to be gratifying. Then the following question arises: What was this result caused by or what was the major role played by? Numerous factors obviously enter into the learning processes – intelligence, memory, motivation, interest [28], [29]. This means that factors from the physical and social and cognitive spheres enter the cognitive processes. Experience and experiences are an active factor in the cognitive process. They play an important role in school learning processes – learners create a relationship with their teachers and with specific school subjects on the basis of their life experiences and emotions [35], [36], [37], [38]. We can therefore assume that the observed positive attitude towards learning foreign languages results not only from the awareness of the necessity to actively use languages for making oneself understood all over the world, but also from a positive attitude towards the subject, which is influenced by the teacher's personality, by the implemented teaching style, by the learner's motivation and by the learner's experiences and feelings gained during language classes and during the course of their school life.

A higher success in the language memory test was confirmed neither in the 7th grade pupils being compared with the 4th and 5th grade pupils, nor in pupils systematically trained in music being compared with those not being trained in music. As it has been already mentioned, a number of variables enter the process of auditory perception. These variables were not a subject of our research. However, they could be researched in a near future. Nevertheless, the results of our similar research cases [27], [30] suggest that an intensive contact with music makes learning languages easier, and that it should be used in our educational practice since it can increase the effectivity of the learning process.

The main implication of our research can be seen for the sphere of the foreign language methodology, in which the number of practical proposals and ideas on how to work with music in foreign language teaching has been increasing. In foreign language teaching, music has the informative function (information about the culture of the target language is provided). Music can also have the productive function (when learners actively work with music or musical texts). Another function of music is the receptive one (the learners listen to and actively work with pieces of music with the foreign language lyrics, and their cognitive potential is enriched). The main benefit of the reproductive use of music can be seen in the mutual relationship between musical and linguistic structures (singing together, rhythmic repetition of individual sections of songs, rhythmic accompaniments, etc.). A great potential of implementing music into the process of foreign language teaching can be seen in the process of practicing the correct pronunciation of foreign language. The opportunities associated with implementation of music into teaching and learning of foreign languages are almost unlimited.

Acknowledgements

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ÚSPĚŠNOST ČESKÝCH ŽÁKŮ V JAZYKOVÉM PAMĚŤOVÉM TESTU

Odborný článek, který vznikl na Pedagogické fakultě Univerzity Hradec Králové, zkoumá auditivní jazykovou paměť a postoj k učení cizích jazyků u českých žáků základních škol. S využitím kvazi-experimentu, který zahrnoval nahrávky 10 různých jazyků, měla studie za cíl změřit efektivitu auditivní paměti v rozpoznávání cizích jazyků. Ačkoli byl obecně pozorován pozitivní postoj k učení se cizím jazykům, data nepodpořila hypotézu, že předchozí hudební vzdělání zlepšuje schopnosti rozpoznávání cizích jazyků. Závěry naznačují nuancovaný vztah mezi hudebním vzděláním a učením jazyků, což otevírá nové možnosti pro vzdělávací strategie ve výuce cizích jazyků.

ERFOLGSQUOTE DER LEISTUNGEN TSCHECHISCHER SCHÜLER IM SPRACHGEDÄCHTNISTEST

Dieser Artikel, der von der Fakultät für Bildungswissenschaften der Universität Hradec Králové stammt, untersucht das auditive Sprachgedächtnis und die Einstellungen zum Fremdsprachenlernen bei tschechischen Grund- und Sekundarschülern. Das Ziel der Studie war es, die Wirksamkeit des auditiven Gedächtnisses bei der Spracherkennung zu messen und die Einstellungen der Schüler zu beurteilen, indem ein quasi-experimentelles Design mit Aufzeichnungen von zehn verschiedenen Sprachen verwendet wurde. Während eine allgemein positive Einstellung gegenüber dem Erlernen von Fremdsprachen beobachtet wurde, stützten die Daten nicht die Hypothese, dass vorherige Musikausbildung die Spracherkennungsfähigkeiten verbessert. Die Ergebnisse deuten auf einen differenzierten Zusammenhang zwischen musikalischer Ausbildung und Sprachenlernen hin und eröffnen neue Überlegungen für Bildungsstrategien im Fremdsprachenunterricht.

WYNIKI CZESKICH UCZNIÓW W TEŚCIE PAMIĘCI JĘZYKOWEJ

Artykuł naukowy opracowany na Wydziale Pedagogicznym Uniwersytetu Hradec Králové poświęcony jest badaniu słuchowej pamięci językowej czeskich uczniów szkół podstawowych i ich nastawienia do nauki języków obcych. Wykorzystując quasi-eksperyment obejmujący nagrania 10 różnych języków, badanie miało na celu zmierzenie efektywności pamięci słuchowej w rozpoznawaniu języków obcych. Chociaż ogólnie zaobserwowano pozytywne nastawienie do nauki języków obcych, dane nie potwierdziły hipotezy, że wcześniejsza edukacja muzyczna poprawia umiejętności rozpoznawania języków obcych. Wnioski wskazują na zniuansowany związek między wykształceniem muzycznym a nauką języków obcych, co otwiera nowe możliwości dla strategii edukacyjnych w nauczaniu języków obcych.