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**CORRELATION OF MEMORIAL LEARNING IN FOREIGN
LANGUAGES AND MUSIC**

Petra Besedova (a)*
*Corresponding author

(a) University of Hradec Králové, Faculty of Education, Rokitanského 62, Hradec Králové, 500 03, Czech Republic.
E-mail: petra.besedova@uhk.cz

Abstract

Memory is an integral part of any learning process, therefore it is also very important part in foreign language teaching (FLT) and besides that, it plays essential role when learning and practising music as well. The correlation of music and language memory reveals a very interesting phenomenon. The main aim of this paper is to introduce the results of the research in which we investigated whether the musically educated respondents have higher memory capacity in FLT than the ones lacking such musical background. The methodology of our study was based on the experiment using the language memory test and the questionnaire method. Both methods were finally completed and statistically processed. The research sample included 165 elementary school pupils (aged 12 to 14) from the Czech Republic. In the first phase of the experiment, the respondents listened to 10 audio extracts of various foreign languages. In the second phase, only 5 languages (out of the previous 10) were selected and played to the respondents again. The respondents' task was to identify them. The study results confirmed our expectations that the respondents having music education background have higher memory capacity in FLT than the respondents lacking such musical education. In view of the fact that there exists a significant similarity between music and language, we can observe their possible mutual practical usage mainly in the fields of ontogenesis, neurology, phonetics and pedagogy. If musically educated pupils have excellent musical memory, based on the intensive memory training.

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1. Introduction

Mark Twain (2019-06-11) said that a good memory and tongue tied in the middle is a combination which gives immortality to conversation. His motto mirrors an essential nature of human being expressing very clear connection between our memory and language - two entities that play one of the main role during the human conversation.

Memory participates in all our mental processes and it is considered as a key factor in language learning. For more of the memory-related language learning see Vrabcová et al. (2019, submitted). The brain transforms our experience into a code which we can understand as a certain transmission of the information into the memory system. Further on, the information is stored in order to be brought back any time needed.

Thus, the similarity between memory learning in FLT and in music studies is apparent. The role of memory in FLT and music comprises of a vast complex of points to be considered. For example, we can speak about a long-term memory of a foreign text and/or long musical compositions, or we can concentrate only on a short-term memory of vocabulary, lexical connections, or a tone pitch. Musical and language memory development is related to the personal experience and practice. A person studying music or a foreign language from an early childhood has usually better language and music memory. In connection to this, higher brain plasticity in childhood age plays its role. Another fact to bear in mind is that the intensive contact with music or any foreign language together with a constant music and language structure repetition considerably help to develop musical and language memory. According to Habibi et al. (2017) on one hand musical training induces macro and micro structural brain changes and on the other hand according to Besedova (2016) the prosodic features of a foreign language such as pronunciation, accent, intonation, melody, stress, tone, word juncture etc. could be taught and practised with the help of music.

2. Problem Statement

Memory participates in all our mental processes and it is considered as a key factor in language learning. The brain transforms our experience into a code which we can understand as a certain transmission of the information into the memory system. Further on, the information is stored in order to be brought back any time needed. It is not easy to define memory, but we can say that one of the memory role in human mind is to code, save and evocate information originated from the previous experiences. Thus, the memory becomes a vital part of many cognitive processes, according to Encyklopedia Britannica (2009). As an example, Nakonečný (2003) understands memory as the neuropsychic disposition and he states that memory is a process and ability to store, organize and use our experience. We understand memory as a well-organized and complicated system determined mainly by the genes and experience which a person acquires during the cognitive processes. The cognitive processes are for us the manifestations of the individual differences in the information processes which are related to cognitive neurologic mechanisms and structures. According to Peterson, Rayner and Armstrong (2009) the cognitive styles are to a certain extend fixed, relatively invariable and represent probably inborn preferences. Based on this definitions' complex, we present our research topic - correlation of memorial learning in foreign languages and music.

2.1. Musical memory

Musical memory is absolutely vital musical ability which occurs on the base of musical experience formation. Lacking the musical memory, there would neither be the music or the music activities. Almost all the scientists consider memory to be the key musical ability. For example, Sedlák & Váňová (2013) understand the musical memory as an ability of human nervous system to accept music information, to process it internally, to maintain and under certain circumstances to evocate, or to reproduce the information from its original form and in the original time sequence. According to Neisser (1967) the musical memory preserves the tracks of the previous cognitive acts, but not the products of such acts.

When speaking about musical memory, there is a necessity to register not only the content, but also the processes. The processes to remember music and other related processes are from psychological point of view very complicated and complex. The memory quality is dependant not only on the previous memory phases, but also on other factors such as perceiving subjects, character and composition of the music, learning style, motivation etc. We can observe various memory constituents as for example hearing, visual, motoric and sensual parts etc. And each of them determines the musical memory. Therefore, we can say that in case of musical memory we speak about a specific structure and entity of general memory which is connected not only to the music perception, imagination and fantasy, but also to the music abilities and knowledge of a person. We also need to mention that very important role plays other secondary factors such as motivation, talent, intelligence, learning abilities etc.

2.2. Language memory

Memory is an important factor for all learners of languages. All findings of the biologists and doctors concerning memory research are very inspiring also for the linguists. We can define the language memory as an imprint, maintenance and simple evocation of the language material. Therefore, the language memory differs from other types of memory not only by its subject, but also by its specific character which is fully realized in speech, in oral and written production and finally in listening and reading activities, it mentions Marek (2009). Language memory is completely integrated into the oral abilities. So called 'subject memory' creates a base of every learning process and we can claim that the grounding of language learning is the memorized material. A physiological memory base is a trace under which we understand the whole complex of grey cortex changes (mechanical, biochemical and electrical).

According to Sternberg (2016), two basic language aspects exist. Firstly, language input decoding mechanism and its understanding. Secondly, coding used for lexical expressions - language output formation. Such decoding means to deduce the sense from any used symbolic reference system. Language coding means a certain thought transformation into the form which is used to express a language output.

It is very important to realise that language memory is very dynamic system which is influenced considerably by many other factors, e.g. subject arrangement, motivation, emotional reaction, voluntary orientation, perceptive complexity, etc. The language perception is focused on descriptions of the grammatical structures and simultaneously it examines psycholinguistic processes which serve for understanding the utterances at higher levels. Language memory and its relation to FLT have been researched from 20th century by numerous scientists: Chomsky, Vygotsky, Johnson and Newport, Bialystok and Hakuta and many others. Ondráková (2017) points out the fact that the research examples taken from

literature and from our own practice prove that an excellent knowledge of the foreign language does not in itself guarantee, that the person with such high level of knowledge is able to identify and correct errors made in other people's performances. Furthermore, it is not guaranteed that such a person is able to explain the errors and to give guidelines how to correct them and how to avoid them in future performances.

2.3. Mutual correlation of music and language memory

Similarity between memory learning in FLT and music studies is apparent. The role of memory in FLT and music comprises of a vast complex of points. For example, we can speak about a long-term memory of a foreign texts and/or musical compositions or we can concentrate only on the short-term memory of vocabulary, lexical connections, or even a tone pitch. Memory is one of the first factor used both in FLT and in music studies.

Musical and language memory development is related to the personal experience and practice. A person studying music or a foreign language from an early childhood has usually better language and musical memory. In connection to this, higher brain plasticity in childhood age plays its role. Another fact to consider is that an intensive contact with music or a foreign language and constant music and language structure repetition considerably help to develop musical and language memory. Therefore, we can claim that learning has a principal importance for the memory processes. But it does not include only repetitions, but mainly the restructuralization and understanding which are the preconditions of permanent memory. Memory in this case stores the facts to be able to understand both the language and musical structures. At the same time it enables to connect a previous language and musical experience with the thinking process.

3. Research Questions

At the beginning of our research we formulated several questions:

- a) To which extent memory influences FLT?
- b) To which extent memory influences the music learning?
- c) Is it possible to follow a certain correlation of memorial learning in FLT and music studies?
- d) Do the musically educated pupils have higher preconditions for FLT?

Considering these research questions, we constituted the following hypotheses which we will try to verify in our experiment:

- 1) Pupils having the musical education will have higher success rate in remembering the foreign language audio tracts than the pupils lacking the musical education.
- 2) Language selection will not have any influence on the success rate in remembering the foreign languages.
- 3) The differences between girls and boys in remembering the language sequences will be insignificant.

4. Purpose of the Study

Musical and language memory is absolutely vital for the abilities which form musical and language experience. From this point of view we consider the memory as one of the key musical and language ability. The main aim of our study is to focus on the elementary pupils in the Czech Republic. Through our experiment - a language memory test - we will try to confirm, or disprove, our principal research question that musically educated pupils have better memory abilities for learning foreign languages than the pupils lacking the musical activities. At the same time we will try to confirm, or disprove, our hypotheses. When speaking about musically educated pupil, we mean the elementary pupil (aged 12 to 14) who attends elementary music school in which s/he is musically educated (e.g. singing, playing on a musical instrument, studying a music theory). A pupil without musical education is in our experiment the pupil (aged 12 to 14) who is not musically educated although s/he is confronted with music in their surroundings, e.g. ordinary music background of a common character.

For our research purposes we chose short-time memory, or working memory, which is in its character temporary and saves the information temporarily - specifically speaking between about 30 seconds to several minutes. The cognitive psychologists, as by Miller (1956), describe the capacity of short-term memory by the number 7 ± 2 . Any remembering in such cases needs very small personal afford to use detected principle. Generally speaking, we can describe the short-term memory as a kind of memory which stores the information until it is either forgotten or saved into the more stable long-term memory. According to the Baddeley's working memory model (1992), there are 3 main components: 1. Central executive system, 2. Visuo-spatial sketchpad and 3. Phonological loop. The relevant part for our experimental purpose is the phonological loop which saves and reproduces speech information and it is essential not only for the mother tongue but also for the foreign language. Simultaneously, it saves and processes the information necessary for the complex cognitive tasks such as learning, thinking and understanding the language.

5. Research Methods

We proceeded in our research in several phases.

5.1. Preparatory phase

We recorded one specific text in several foreign languages in the pre-phase. Our model text was very simple and lasted around 30 seconds. The model text follows:

"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 recordings were done from August to November 2018 by the native speakers only. The main stress was put on a typical melody of the chosen foreign language which the native speakers knew beforehand. The recordings were produced either personally by the native speakers, or by using a distance

recordings through a mobile programme apparatus sent via emails. We made 26 foreign language recordings altogether. Unprocessed recordings in all the languages were produced by various types of recording equipment and recorded in variety of digital formats in acoustically unsatisfactory conditions. Our first goal was to unify all recordings into the same digital format so that the subsequent editing processes could be made. All work was done in the editing workplace equipped by the professional editing software Steinberg Cubase and Acoustica, the Desktop Recording Studio Lexicon Lambda, the audio mixing console SoundCraft GB2R-12/2, the professional 8 track recorder Zoom F8, and the active coaxial stage monitors RCF NX10-SMA suitable for the near field listening.

5.2. Study proceeding

Data collection for the pilot study took place from February till March 2019 and tried to determine the correlation of the memorial learning in FLT and in music performances. All participants were firstly familiarized with the experiment in written form and subsequently they were asked to sign an informed consent. Then, a questionnaire was used in the following phase. We divided the respondents into two monitored groups: 1. pupils with musical education, 2. pupils without musical education. We tested 165 elementary pupils (48 ♂ and 117 ♀). Further on, our questionnaire was designed also to find out the degree of respondents' relation to music and foreign languages. Nevertheless, such findings are not relevant for this paper topic, therefore our results will not be included.

In our audio memory test the respondents firstly listened to a complex sequence of 10 foreign languages including the same text (more about the text see above in 5.1 preparatory phase). The foreign languages were in this order: Kazakh, Turkish, Malay, Vietnamese, Danish, Greek, Swedish, Japanese, Chinese, and Finnish. Then, the respondents listened again to a sequence but containing only 5 foreign languages (out of the previous 10) and their task was to try to identify those 5 languages according to what they remembered from the first listening. We prepared two 5-language sequences according to our language key seen in Table 01. The sequence number 1 included the following languages in this order: Greek, Turkish, Chinese, Finnish, and Vietnamese; the sequence number 2: Danish, Japanese, Kazakh, Swedish, and Malay. Our major intention in the language division was to include equally the language families and groups in each sequence in order to lay a basis for one of our hypothesis that the sequence selection should not have any striking influence to the respondents' success rate.

Table 01. Table of the foreign languages and their classification used in our study.

LANGUAGE	FAMILY	GROUP	SUB-GROUP
Greek	Indo- European		
Danish	Indo- European	Germanic	North-Germanic
Swedish	Indo- European	Germanic	North-Germanic
Malay	Austronesian	Malayo-Polynesian	Malay
Vietnamese	Austro-Asiatic	Mon-Khmer	
Japanese	Japanese-Ryukyuan	Sino-Thai	
Chinese	Sino-Tibetan	Sino-Tibetan	
Kazakh	Altai	Turkic	
Turkish	Altai	Turkic	Oguta
Finish	Uralic	Finno-Ugric	Balto-Finnic

5.3. Data Processing

Our pilot study data were pre-processed in MS Excell programme and the subsequent calculations in IBM SPSS Statistics 24 programme. Firstly, we checked the duplicity detection. The metric variables were verified concerning their scale, i.e. minimum and maximum correspond to the theoretically possible scale range. Secondly, we did calculations of descriptive statistics in order to describe the research set: minimum, maximum, average, anomaly for age variable, arrangement in gender and researched group. The calculations for comparison the success of each sequences were done. The median test as well as the Kruskal-Wallis test confirmed that there is no statistically significant difference. Therefore, we deduced that the sequences are equivalent and our hypothesis that the sequence selection would not have any influence on the success in remembering the foreign languages was proved.

6. Findings

We set up three hypotheses which we wanted to either confirm or disprove. The answer to our first hypothesis, that the musically educated pupils will have higher success rate to remember the foreign languages than the non-musically educated ones, can be seen in Fig. 01. Our hypothesis was fully confirmed. The musically educated pupils had higher success rate (37,62%) in their language memory test than the non-musically educated pupils (23,21%). The average success in language memory test was 30,55% which means that out of 5 given languages 3 were identified well. In that case we can say that musical education certainly support foreign language learning, mainly when considering supra-segmental area.

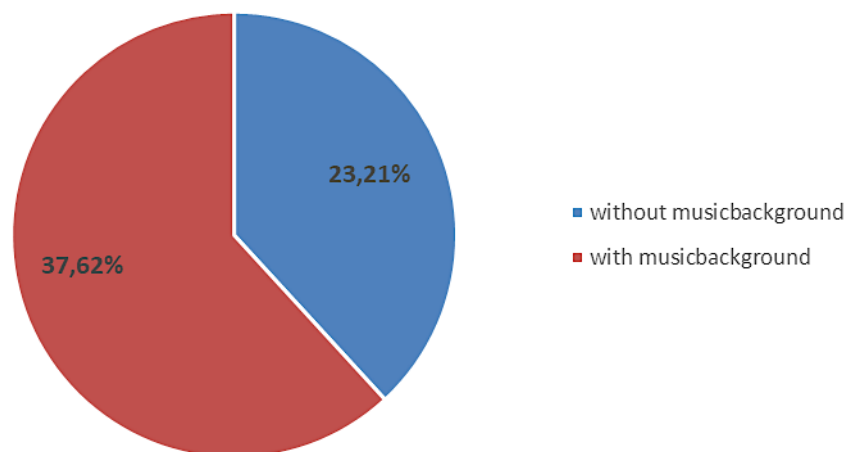


Figure 01. Differences between pupils with/without music background

We used two sequences (see more in Research Methods) in which the languages were divided according to their language families. The language families were equally presented, therefore we assumed that the selection of the sequence would not have any influence on the success rate in remembering the languages. Our hypothesis was confirmed, because the ratio 33,1% (sequence 1) and 27,9% (sequence 2) are comparable, i.e. do not show higher differential rate, see Table 02.

Table 02. Differences in success rate of the language memory test between sequences n.1 and n.2.]

Sequences	Success rate
1. Sequence	33,10%
2. Sequence	27,90%

Our last hypothesis concerned the differences between the girls and boys in the success rate of the language test. We presumed that the gender would not play any significant role. As we can see in the following table, the differences between girls (30,43%) and boys (30,83%) did not play any role in the language memory test and therefore it is not possible to say that girls are more successful than the boys, or vice versa. Our hypothesis was fully proved.

Table 03. Role of gender in the language memory test

Sex	Success rate
Female	30,43%
Male	30,83%

Our results proved that musically educated pupils have higher success rate in the language memory test and we can expect them having better predispositions for learning foreign languages than the non-musically educated pupils. We are aware of the fact that the learning processes are influenced by various other factors, e.g. intelligence, talent, will, perception, and many others that are essential parts of the language learning. We observed in our study only the factor of memorial learning, more precisely from the point of supra-segmental view in which we focused mainly on foreign language melody. For further understanding of the relation between the music and FLT, it is necessary to focus also on other above mentioned aspects and undergo more experiments.

7. Conclusion

FLT is connected with variety of factors playing essential role in successful learning. It can be complicated by many existing kinds of learning strategies which we understand as a process of gaining and using the experience that enables us to adapt to the permanently changing situations and it is directly connected to the memory where the learning experience is saved and under the certain conditions it can be intentionally reproduced, according to Nakonečný (2003). Evidently, we cannot learn any language without the language memory. Similarly, there is no musician without the music memory. Interconnection of the music and language memory is a frequent phenomenon. H. Gardner in his theories connected linguistic and music intelligence, which plays an important role in the memory. According to Smith (2007), we can analyzed such interconnection from 4 points of view: 1) onto-genetic - music and speech mean for a person a communication through the sounds (they have in common the features such as changes in pitch, tone, intensity, rhythmical and pace elements), 2) neurologic - co-operation of the cognitive structures needed for language and music has been already proved, 3) phonetic - vital part of any language study is its prosodic system (phonetics), and 4) pedagogic - taking into account a great number of similarities between music and language, we can trace their mutual usage.

The Gardner's principles inspired our study of the relation of music and language and we focused on the correlation of memorial learning in FLT and in music studies. A lot of research work proved that there exists very close co-operation between the music and language brain centres, for example Besedova et al. (2019) or Peretz and Zatorre (2005), which is manifested mainly in musical people who can learn foreign languages easier and even quicker because they have higher sensitivity to the intonation and melody. The principal result of our study corresponds directly with the mentioned thesis, because we proved in our experiment that the musically educated pupils have higher success rate in language memory test than those not having such musical background. To sum up, we can say that there exist very obvious parallels between music and language memory. Therefore, we should definitely strengthen the presence of musical elements in FLT for example by the active singing of the songs, or even by passive listening to the instrumental music. The teacher in such case develops not only the pupils' language, emotional and cognitive perception, but stimulates also their sense for language which we see as absolutely essential part of the language education.

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