

# Short-term memory and knowledge of L1 and L2 by Roma children of Cyprus

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**Abstract.** The study of short-term memory and language learning conducted with primary school Roma children in Cyprus aimed to determine how children who grow up in economically disadvantaged families learn their mother tongue (L1) Turkish and their second language (L2) Cypriot Greek. Two groups of children (20 children aged 8 and 20 children aged 10), a total of 40, were tested with the Picture short-term memory test, the Peabody vocabulary test, the sentence repetition test and the number repetition test. The study seeks to answer the research question: "How does the short-term memory test help Roma children to perform the tests in their L1 and L2?" The research findings were statistically analysed with SPSS and ANOVA and showed correlations between the independent factors of age group, gender, and testing language. The result showed that the children performed the tests much better in their mother tongue (L1). They need help learning some of the grammatical categories from the Greek language. The Processability Theory of Pienemann (1998) is examined. According to this theory, the production of linguistic structures is possible without any conscious or non-conscious attention because the locus of the attentive process is short-term memory. For the children to attain the necessary academic level of Greek, the teachers working with Roma children should receive training to develop children's bilingualism when instructing children growing up in a multilingual environment such as Cypriot society.

**Keywords:** short-term memory, bilingualism, Turkish, Roma, Gurbets, language learning, Processability theory, Cyprus.

**Ключуков Хрісто, Кіратджі Хелен, Пелекані Хрісо. Короткотривала пам'ять і знання Мови 1 та Мови 2 ромськими дітьми на Кіпрі.**

**Анотація.** Дослідження короткотривалої пам'яті та вивчення мови, проведене серед ромських дітей молодшого шкільного віку на Кіпрі, мало на меті визначити, як діти, які ростуть в економічно неблагополучних сім'ях, вивчають свою рідну мову (М1) турецьку та другу мову (М2) кіпрську грецьку. Дві групи дітей (20 дітей у віці 8 років і 20 дітей у віці 10 років), загалом 40 осіб, були протестовані за допомогою тесту на короткотривалу пам'ять за картинками, тесту на словниковий запас Пібоді, тесту на повторення речень і тесту на повторення чисел. Дослідження має на меті відповісти на запитання: «Як тест на

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короткотривалу пам'ять допомагає ромським дітям виконувати тести на рівнях M1 та M2?» Результати дослідження було піддано статистичному аналізу за допомогою SPSS та ANOVA і виявили кореляції між незалежними факторами вікової групи, статі та мови, якою проходилося тестування. Результат засвідчив, що діти набагато краще виконували тести рідною мовою (M1). Вони потребують допомоги у вивченні деяких граматичних категорій з грецької мови. Проаналізовано теорію здатності до перероблення Пінеманна (Pienemann, 1998). Згідно з цією теорією, продукування мовних структур можливе без будь-якої свідомої чи несвідомої уваги, оскільки локусом уваги є короткочасна пам'ять. Аби діти досягли необхідного академічного рівня з грецької мови, вчителям, які працюють з ромськими дітьми, слід пройти підготовку задля розвитку двомовності у дітей, які зростають у багатомовному середовищі, такому, яким, наприклад, є кіпрська спільнота.

**Ключові слова:** короткотривала пам'ять, двомовність, турецька мова, ромська мова, гурбети, вивчення мови, теорія здатності до перероблення, Кіпр.

## Introduction

Cyprus is a multicultural country (Zembylas, 2012) with three groups of “Gypsies”: European Roma who are economic migrants to Cyprus and are usually L1 speakers of Romani; the Christian Greek-speaking Roma; and a Turkish-speaking group called “Gurbets” – a Muslim group who have lived for centuries in Cyprus (Pelekani, 2018). In 1974 the Turkish invasion divided the country into two parts: Greek Cyprus and Turkish Cyprus. The Gurbets had moved to the north of Cyprus, occupied by the Turkish army. However, after 2004 many Gurbets relocated to the south of Cyprus (Greek-speaking area) when Cypriots were allowed to move to other places in the island. It is difficult to record and officially ascertain the exact number of the Roma population in Cyprus in the most recent period. The total number of Cyprus Roma is estimated at between 650 and 1250 (Roma Civil Monitor, 2023). The Roma groups in Greek Cyprus mainly reside in the districts of Limassol and Paphos.

The majority of Gurbets in Cyprus are Turkish-speaking and have been classified as belonging to the Turkish Cypriot community. However, there are Roma who are Christians and Greek-speaking, known as *Mantides*, and they were included in the Greek Cypriot community in 1960. They abandoned the nomadic lifestyle and today are largely assimilated; their descendants can be recognised, if at all, only by their surnames (Trimikliniotis & Demetriou, 2009).

The present study focuses on the Turkish-speaking Gurbeti Roma children who speak Turkish as L1 and Greek as L2. According to Cummins (2007) conceptual knowledge in L1 and L2 is interdependent, meaning that concepts, academic content and learning strategies transfer across languages. He argues that neither the “direct method” (instruction exclusively through the target language) nor the “two solitudes assumption” (strict separation of languages in an immersion program) have a solid research basis. This monolingual instructional orientation should be complemented by bilingual/multilingual instruction as they are more efficient and consistent with the interdependence that exists among languages. The “interdependence hypothesis” discussed by Cummins (2005) has been adapted to the present research context to the extent that the learning of Turkish as L1 is effective in promoting proficiency in

Greek as a L2. Transfer of this proficiency will occur if there is adequate exposure and motivation to learn L1 and L2.

In this case, L1 and L2 are typologically dissimilar languages where transfer is expected to occur mainly on the conceptual level. Whether it is an added language, like English, or any of the school languages, Turkish and Greek, the “interdependence hypothesis” implies that it is pedagogically “appropriate” to refer to transfer across languages and that a form of constructive analysis can help investigate similarities and differences in the two languages and develop linguistic awareness and motivation to learn L1 and L2.

The Gurbeti Roma children experience palpable ingrained stereotyping and prejudices from both communities (Turkish and Greek) due to their different culture and lifestyle. Despite state policies aimed at permanently settling the Roma Gurbets of Cyprus, the nomadic tradition continues in some Gurbets families. As a result, children miss school for extended periods of time. In addition to that, both Roma Gurbeti boys and girls register after elementary school at the secondary school, but most do not continue their studies; they drop out of school either because their parents do not allow them to attend the school, or because of early marriage.

The Roma children grow up in a traumatized environment. Some of the Roma parents are involved in illegal activities, and their families and children experience poverty and hunger. Living in these difficult conditions, the children must attend school and have to achieve a certain level of success. The educational system of Cyprus following the European multilingual direction developed classes of mother tongue education for Gurbeti children in order to develop their language capacities in their mother tongue and also to motivate them to attend school in order to complete their primary and secondary level of education. However, the educational problems of Cypriot Roma children are no different from the educational problems of Roma children in Europe.

Kandylaki and Kallinikaki (2018) report about an educational project with Muslim Roma children in Thrace in Greece and how they encourage the students who dropped out of school to improve regular attendance of school. Although education is a right and an obligation for children, it is not always the case for the Muslim Roma communities because of poverty, poor health and inter-generational illiteracy. New and Merry (2012) in a study with Greek Roma students note that their access to education are very limited. The authors address the question of learning through the psychosocial construct of stigmatization. “According to advocates for Romani rights and scholars, the most damaging kind of school segregation is that which results in a stigma on Romani students that cannot be eradicated, contributing greatly to the social isolation and dreadful living conditions experienced by most Rom” (p. 623).

The situation of Roma children is the same in Slovakia (New, 2011; Samko, 2020; Samko et al., 2021). The Slovak government promotes assimilatory educational policies towards Roma students, who live and study in stigmatization, which does not give them the possibility to succeed at school. In number of studies, Kyuchukov et al. (2024), Kyuchukov (2021; 2023; 2024) sheds light on the linguistic educational problems of Roma children from Bulgaria, when they acquire their mother tongue at

home or when they have to acquire literacy in their L2 at school and describes the difficulties the children encounter when seeking to gain better knowledge of their L1 or/and L2.

Siegel (2003) describes the sociolinguistic settings for second language acquisition (SLA) and describes the L2 as the dominant language and “the native language of the majority of the population and used in all domains in everyday life, including the home, education, government, the legal system, business, and the media” (p.179). The children who belong to minority groups are expected to acquire the dominant language at school or outside of the school system in order to be able to participate in the everyday life of society. Marinis and Cunnings (2018) say that in learning language, second language learners have to develop both comprehension and production skills, but the two modalities do not develop simultaneously. Comprehension usually develops earlier than production. The authors suggest that the assessing the learner’s knowledge comprehension should be separately tested from production.

In our study we focus on the production knowledge of the Gurbeti children in Cyprus in their L1 and L2; for the purpose of the study, we apply Processability theory (PT) as developed by Pienemann (1998). According to PT the “recourse needs to be made to key psychological aspect of human language processing” (p. 5). Pienemann states that “the real time production of language can only be accounted for in a system in which word retrieval is very fast and in which the production of linguistic structures is possible without any conscious or non-conscious attention, because the locus of attentive process is short-term (or immediate) memory.” (p. 5).

Language learning studies and short-term memory are mainly connected in research on learning the phonology. Very few studies deal with other linguistic levels. According to Juffs (2006, p. 105) “in SLA, researchers have focused on short-term rather than long- term memory differences because they think short-term memory is more responsible for differences in language development. The reason for this belief is that short-term memory is an on-line capacity for processing and analyzing new information (words, grammatical structures and so on); the basic idea is that the bigger the on-line capacity an individual has for new information, the more information will pass into off-line, long-term memory.” Baddeley (2017) connects the verbal short-term memory (STM) to a long-term memory (LTM). The author asks a simple but important question about the function which the STM serves and particularly if it improves the working memory. The author uses the term STM to refer “to the simple storage of limited amounts of material over brief delays, in contrast to working memory, a theoretical concept that assumes an integrated system involving both temporary storage and attentional control, a system that supports a wide range of cognitive processes and tasks.” (p. 105)

Jones and Macken (2018) report that “studies using tests such as digit span and nonword repetition have implicated short-term memory across a range of developmental domains. Such tests ostensibly assess specialized processes for the short-term manipulation and maintenance of information that are often argued to enable long-term learning.” (p. 216)

The research question we endeavor to answer with this study is:

*How does the short-term memory test help Roma children to perform the tests in their L1 and L2?*

Our working hypothesis is that the bilingual/multilingual Roma children are developing normally, but they grow up traumatized due to the poverty they grow surrounded by.

## Method

The trauma of the children could give rise to various difficulties with education at school and learning the official language as L2. To investigate this phenomenon, two groups of primary school children are involved in the present study. All of them attend a primary school in the city of Limassol, Cyprus. They are organized in two age groups:

- 1st group 8 years old (20 children);
- 2nd group 10 years old (20 children).

In order to test our hypothesis and answer the research question, we designed a research scheme including the following tests:

*Candem Memory Test: Pictural Recognition Memory Test* (Warrington, 1996). The content of the test is as follows. In the first part the children are shown 30 pictures, and each picture is on a separate page. The second part of the test comprises the same 30 pictures in a mixture with 2 other pictures, in total 3 pictures on a page, as shown below. The task of the children is to remember which picture the children have seen in the first part of the test.

Figure 1

*Candem Memory Test: Pictural Recognition Memory Test* (Warrington, 1996)



- *Sentence Repetition Task* - 9 items. The child hears sentences, which he/she then repeats after the researchers have spoken. The researcher starts with simple sentences containing 2-3 words and in each subsequent sentence the number of the words increases. The researcher says: *Repeat after me!* and then says the following sentences:

The baby cries  
The horse runs fast!  
The boy goes to supermarket, etc.

- *Number Repetition Task* – 12 items. The children are given numbers and they must repeat them after the researcher.

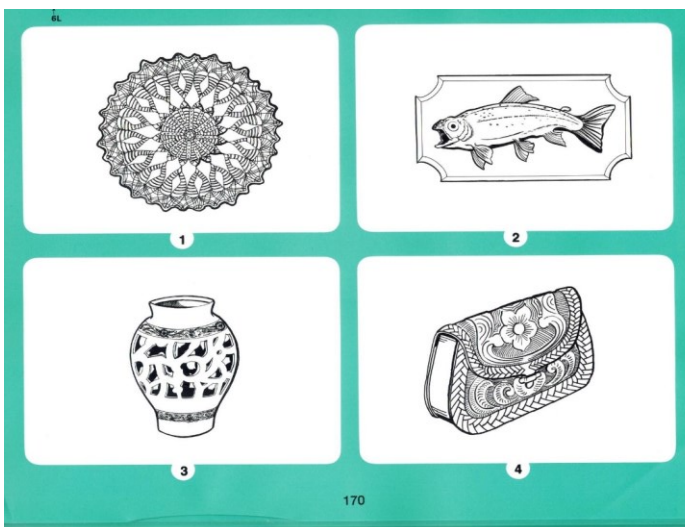
Repeat after me!

4, 2  
3, 5  
5, 6, 2  
3, 1, 4  
6, 1, 7, 2  
3, 5, 8, 4, etc.

- *Peabody Picture Vocabulary Test* – 55 items. The children are shown pictures with the task to see which object out of the 4 objects on the page does not fit in with the other 3. The grammatical categories involved in the test are:

Nouns – 42 items  
Verbs – 9 items  
Adjectives – 4 items

Figure 2  
*Peabody Picture Vocabulary Test*



The design of the study and the selection of the tests are guided by the concept that there is a connection between short-term memory and language learning. We assume that the digit span test, repetition of sentences, lexicon richness, are predicted by the performance of the short-term picture memory test

The testing of the children had the following procedure. During the first week the children were tested in their mother tongue – Turkish (by the first author) and in the second week they were tested using the same tests but in their second language – the Cypriot variety of Greek. The testing in Greek was done by a teacher who is a native speaker of Greek. All the children were tested in a school environment, in a separate room where the researcher and the child are present. All the answers of the children were written in special protocols and later analyzed with the SPSS and ANOVA statistical package.

To conduct the research, permission was obtained from the local office of the Ministry of Education of Cyprus and written permission from the parents of the children was received. The tests do not cause psychological and physical harm to the health of the children involved in the study.

## Results

Analyzing the data, a three-factorial design with *gender*, *age group* and *language of testing* as independent variables were investigated.

### Short-Term Memory Test

The results from the short-term memory test are shown in Fig. 3.

Figure 3

*Total Score on Short-Term Memory Test as a Function of Age Group as an Independent Factor (Three-Way ANOVA)*

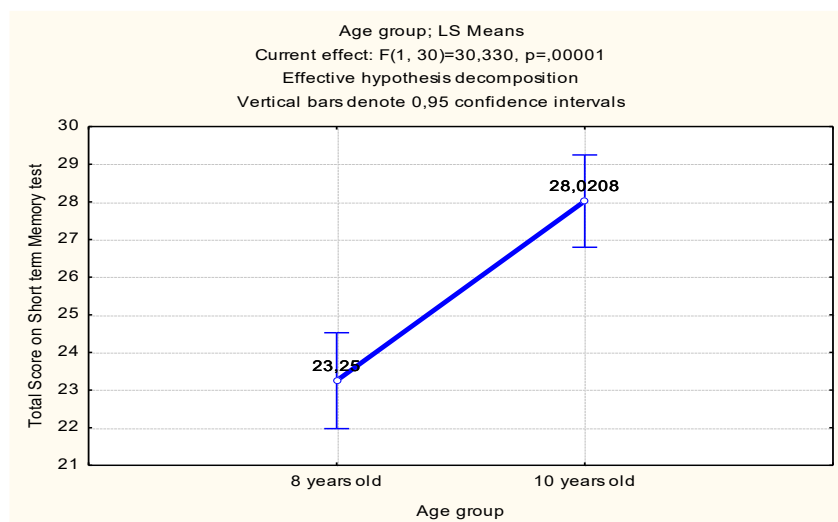


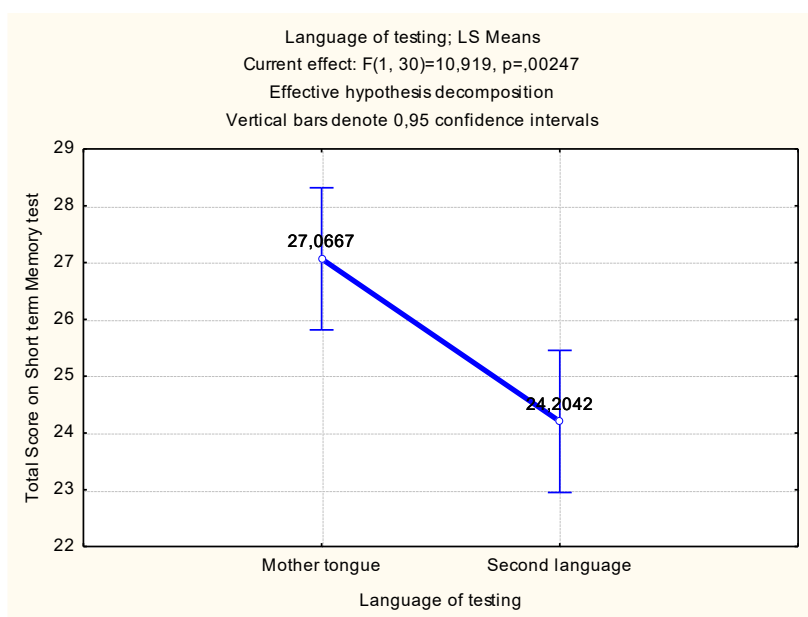


Fig. 3 shows statistical differences between the two age groups of children. The differences are significant  $F(1, 30) = 30.330, p = .00001$ . The 10-year-old children perform the test better than the 8-year-olds. This result shows that with increased age the children's short-term memory increases.

Let us examine what the total score on short-term memory test is as a function of the language of testing as an independent factor. The results are shown in Fig. 4.

*Figure 4*

*Total Score on Short-Term Memory Test as a Function of Language of Testing as an Independent Factor (Three-Way ANOVA)*



As can be seen from Fig. 4, the performance of the test is much better in the mother tongue of the children than in their second language. The differences between the performance of the test in both languages are statistically significant  $F(1, 30) = 10.919, p = .00214$ .

The results from this test show that two independent factors - age and language - play an important role in the performance of the test. The short-term memory of the children increases as they grow older, and the performance of the test is better in their mother tongue (Turkish) than in their second language (Cypriot Greek).

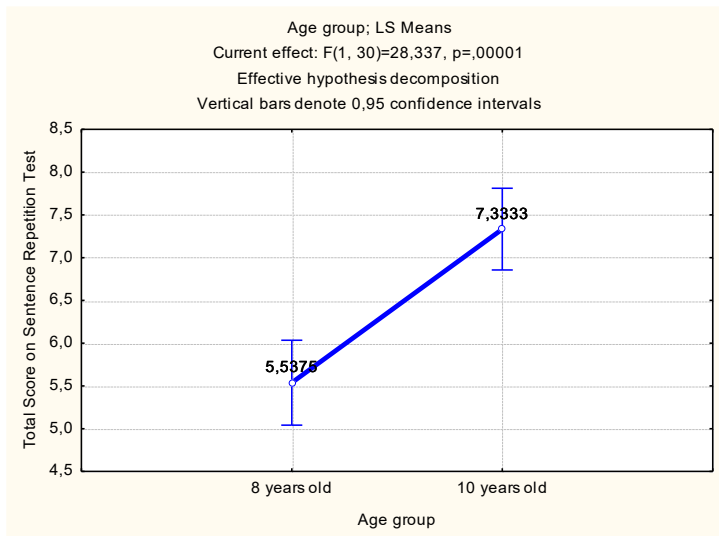
### Sentence Repetition Test

One of the language tests given to the children was the sentence repetition test. Fig. 5 presents the results from the performance of the sub-test.



*Figure 5*

*Total Score on Sentence Repetition Test as a Function of Age Group as an Independent Factor (Three-Way ANOVA)*

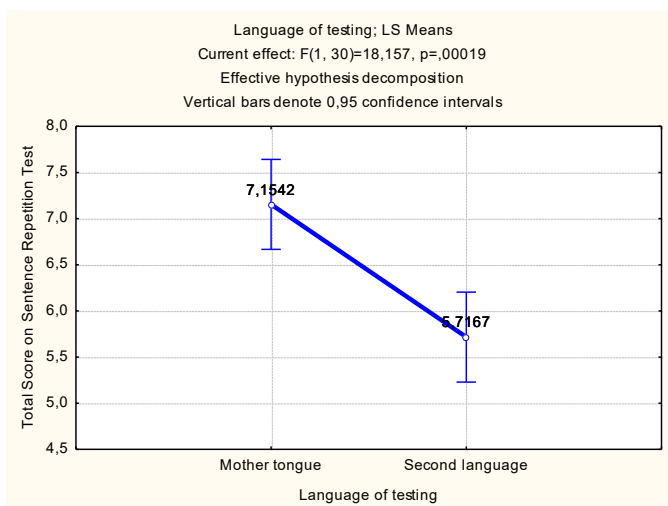


The results presented in Fig. 5 show that once again, the 10-year-olds are better in the performance of the sub-test and the differences between the two age groups are statistically significant  $F(1, 30) = 28.337, p = .00001$ . In practice this means that the older children can repeat longer sentences more correctly than the younger children. The sentences included in the test comprised 2, 3, 4 and more words. The first 2-3 sentences were simple sentences, and they were easy for the 8-year-olds to repeat. The older children also repeated the sentences which had relative clauses.

Which language was easier for the children in order to perform this sub-test? The answer is shown in Fig. 6.

*Figure 6*

*Total Score on Sentence Repetition Test as a Function of Language of Testing as an Independent Factor (Three-Way ANOVA)*



As can be seen from Fig. 6, the children repeated the sentences much better in their mother tongue. The differences between the performance of the test in both languages are statistically significant  $F(1,30) = 18.157, p = .00019$ .

The sentence repetition test is better performed by older children in their mother tongue. They can repeat complex sentences which have relative clauses in their mother tongue more easily than in their second language.

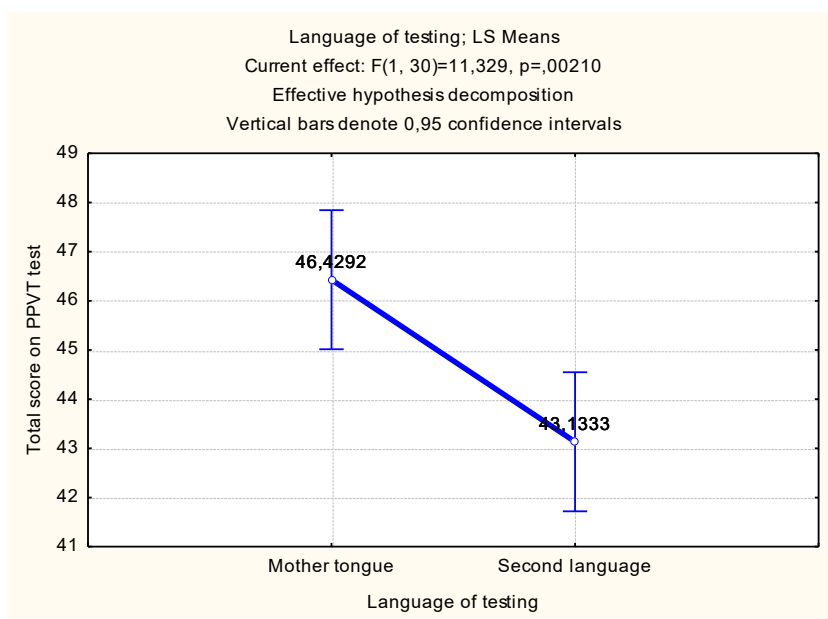
The second language test was the Peabody vocabulary test.

### Peabody Vocabulary Test (PPVT)

The Peabody vocabulary test was also performed in both languages that the children speak. The results from the test as a function of the factor language are shown in Fig. 7.

Figure 7

Total Score on Peabody Vocabulary Test as a Function of Language of Testing as an Independent Factor (Three-Way ANOVA)



The test was performed very well in the mother tongue of the children, Turkish. The differences between performances in both languages are statistically significant  $F(1,30) = 11.329, p = .00210$ .

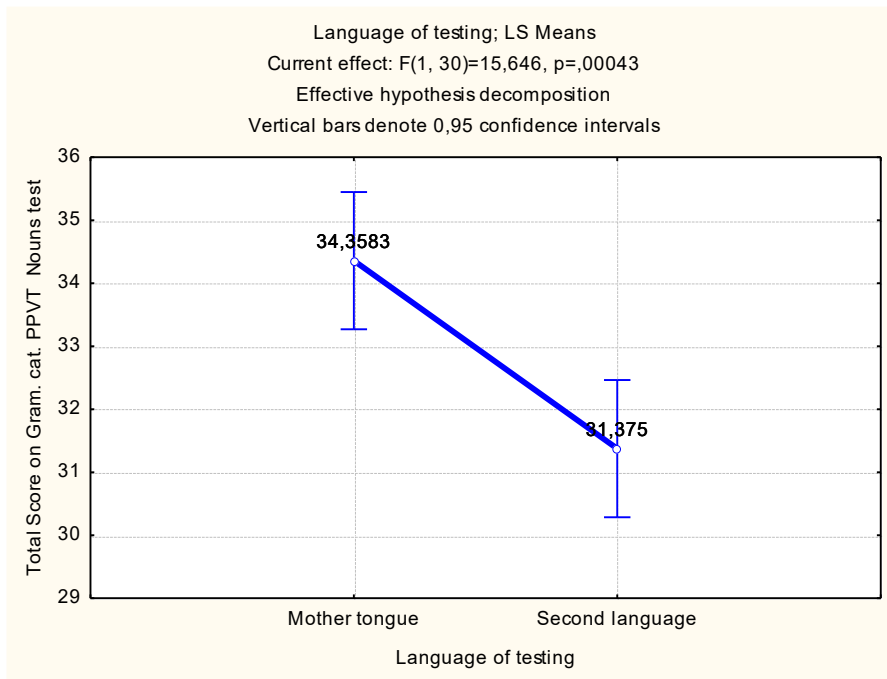
Three grammatical categories were included in the performance of this test: nouns, verbs and adjectives.

### Nouns

The language production of the noun in the mother tongue is shown in Fig. 8.

*Figure 8*

*Total Score on Peabody Vocabulary Test (PPVT)- The Nouns as a Function of Language of Testing as an Independent Factor (Three-Way ANOVA)*



The nouns are produced much better in Turkish. The differences between the performance of the test in both languages are statistically significant  $F(1,30) = 15,646$ ,  $p = .00043$ . Here the age of the children is not an important factor. Both groups are good at performing the test in their mother tongue.

## Verbs

Looking at the verb production of the children, it seems that their results in both languages are equally good. The independent factors age, gender and language do not have any influence on the children's performance of the test.

## Adjectives

What was the children's performance on adjectives as a grammatical category? The results are shown in Fig. 9.

Figure 9

Total Score on Peabody Vocabulary Test (PPVT) - Adjectives as a Function of Interaction Between Factors Gender and Age Group (Three-Way ANOVA)

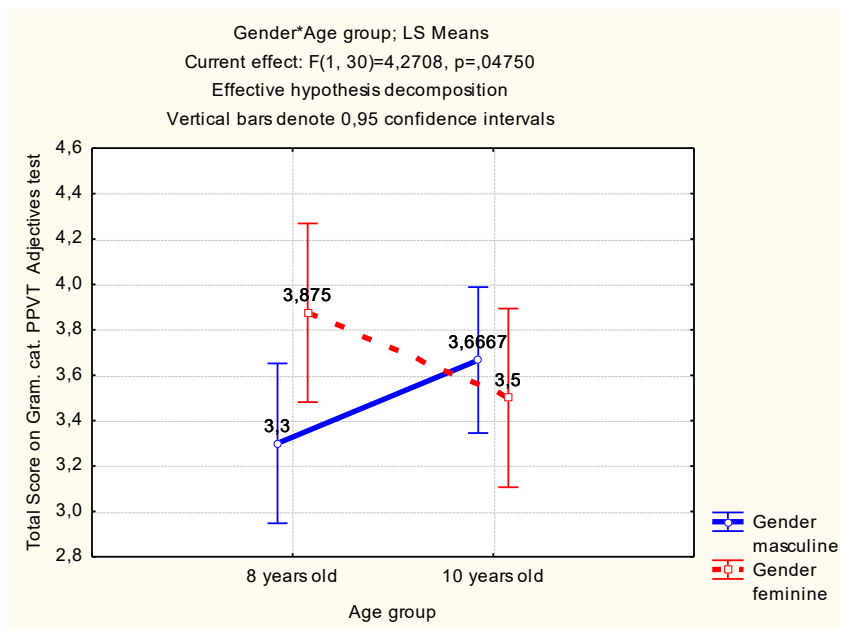


Fig. 9 shows that two factors – age group and gender – are interacting. The 8-year-old children show statistical difference between the performance of the boys and girls. The children 10 years old do not display these differences. The differences between the children aged 8 and 10 are also statistically significant  $F(1,30) = 4.2708$ ,  $p=.04750$ .

The results from the Peabody vocabulary test show that the children perform the test better in Turkish. The nouns are recognized better in Turkish as L1. However, the verbs and the adjectives are recognized equally well in both languages. In the recognition of the adjectives, there are also gender differences between boys and girls along with the age differences.

### Number Repetition Test

Both age groups of children, from both genders and in both languages, do not have any difficulties performing this sub-test. No independent factor has a statistically significant impact on this dependent variable. The children’s knowledge and ability in number repetition is very good. All the children show good results.

In summarizing the results from the tests of the children, Table 1 shows the correlation between the sub-tests.

Table 1  
*Correlations Between All 6 Sub-Tests*

	<b>Total Score on Sentence Repetition Test</b>	<b>Total Score on Number Repetition Test</b>	<b>Total score on PPVT Test</b>	<b>Total Score on Gram. cat. PPVT Nouns Test</b>	<b>Total Score on Gram. cat. PPVT Verbs Test</b>	<b>Total Score on Gram. cat. PPVT Adjectives Test</b>
<b>Total Score on Sentence Repetition Test</b>	1.000000	.253781	<b>.528412</b>	<b>.558603</b>	.165074	.127417
<b>Total Score on Number Repetition Test</b>	.253781	1.000000	.173570	.084268	<b>.335611</b>	.060497
<b>Total score on PPVT Test</b>	<b>.528412</b>	.173570	1.000000	<b>.934899</b>	<b>.546657</b>	<b>.405132</b>
<b>Total Score on Gram. cat. PPVT Nouns Test</b>	<b>.558603</b>	0.084268	<b>.934899</b>	1.000000	<b>.372726</b>	.253852
<b>Total Score on Gram. cat. PPVT Verbs Test</b>	.165074	<b>.335611</b>	<b>.546657</b>	<b>.372726</b>	1.000000	.051458
<b>Total Score on Gram. cat. PPVT Adjectives Test</b>	.127417	.060497	<b>.405132</b>	.253852	.051458	1.000000

Correlational differences are statistically significant. As can be seen from Table 1, the total score of sentence repetition test correlates with the total score of the Peabody test and with the total score of the nouns test. The total score of the number repetition test shows correlation with the total score of the verbs in the Peabody test. The total score of the Peabody test correlates with the total scores of the sentence repetition, nouns, verbs and adjective tests. The total score of the noun test correlates with the total score of the Peabody test. The total score of the verbs test correlates with the total score of the number repetition test and with the total score of the Peabody test and the nouns test. The total score of the adjectives test correlates only with the total score of the Peabody test.

The correlations between the sub-tests of the Peabody Test with number repetition and sentence repetition tests show that the children are able to learn new words in L1 and in L2 and it is connected with their short-term memory.

## **Discussion and Conclusion**

How is our study related to the previous studies in this field? Thorn and Gathercole (1999) investigated the sensitivity of children's phonological short-term memory performance to language specific knowledge. They found that with English-French bilingual children, and English children who were learning French as a second language, their short-term memory performance in each language mirrored their familiarity with English and French, with greater vocabulary knowledge being associated with higher levels of recall of both words and non-words in that language. The findings indicate that phonological short-term memory is not a language-independent system but rather functions in a highly language-specific way.

In a study with monolingual and bilingual children, Marini, Eliseeva and Fabbro (2016) found that the bilingual group outperformed monolinguals on two simple and one complex span task assessing phonological short-term and working memory, respectively. They performed as monolinguals on measures assessing articulatory skills, phonological abilities, naming and grammatical processing in L1. However, bilingual participants performed less well than monolinguals on a test of lexical comprehension. Another study by Verhagen and Leseman (2016) dealing with verbal short-term memory (VSTM) found that it is related to vocabulary learning. The working memory is related to the learning process of children studying a second language (L2) in classroom. The study was conducted with Turkish children who learned Dutch as an L2 and Dutch monolingual children. The authors found that memory factors were significantly related to the acquisition of morphology and syntax.

In a study by Symeou et al. (2009) with semi-structured interviews with Roma pupils, their parents, and their teachers, from three schools attended by the largest numbers of Roma children in the Greek Cypriot educational system, the authors came to conclusion that the teachers working with Roma children need specific training for educating Roma students in multicultural school settings. The authors also reflect on the factors that need to be addressed if education is to become inclusive for all pupils in general, and Roma children in particular. Martinez-Gonzalez et al. (2008) conducted a comparative study with Roma children in Spain and Cyprus and inter alia also investigated the academic expectations for their children and parental concern regarding their children's education. Results showed that the Spanish families have a more protective parenting style than the Cypriot families and they are more interested in the academic achievements of their children than the Cypriot parents.

Returning to our research question, how the short-term memory helps Roma children to learn their L1 and L2, we can conclude that the bilingual Roma children

in Cyprus show normal cognitive and intellectual development. Although they are traumatized because of the economic conditions in which they grow up, their L1 is developing quite well. The L2 development of the children needs better support, and as Simeou et al. (2009) stress, the teachers working with bilingual Roma children need to have training in how to work with them in multilingual settings and how to develop their bilingualism to the level which will help them to achieve academic success at school. Short-term memory exercises help them to learn a second language better and quicker, because it relates to the Processability Theory.

## Disclosure Statement

The authors reported no potential conflicts of interest.

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