# Anagram Based L2 Activation

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The aim of the present study is to investigate the Hungarian-English word recognition among sixty of 15 years old, Hungarian, secondary school students, who learn English as the first foreign language. Moreover to ascertain how English and Hungarian languages become activated in a paper based word recognition test including anagrams. Based on the literature, I suppose that instructed English language learners recognize the first language (Hungarian) input more successfully. On the top of all that I am eager to see the various factors that affect word recognition. The results show that word frequency effect is a key factor irrespective of the language proficiency.

**Keywords**
Anagram, L2 activation, language processing, word frequency word recognition

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## Introduction

The question of is it good or not for language learners to start the acquisition of the written forms of their L1 and L2 at the same time has become a critical issue in language teaching in the XXI century. Many teachers believe that children are not capable of learning two writing systems at a time, and they claim that learners will be confused and delayed in their learning processes. It is generally accepted that children first should learn how to read and write in their L1, and so learning a second language should only be started some years later. However, literature so far has found that exposure to two similar writing systems at a time may even accelerate the acquisition process of the written language (Bialystok, 2004).

As a practicing teacher, I can wholeheartedly say that only the exposure counts, no matter how early or late you start, and not the simultaneity is the key concept. A weak student can reach good results too in language learning, if he or she deals with the given point continually. As opposed to natural bilinguals, who are exposed to both of the languages in their everyday lives, instructed bilinguals mainly use their L2 only in education, in the language classroom. In the XXIst century, exposure to a second language, especially to English, next to school instruction, is at disposal with the wide access to information technology devices such as mobile phones, computers, laptops, tablets etc. Written foreign language enters kids' life in a way and at a time when they are not aware of it, and this contributes to the development of their metalinguistic, cognitive, and phonological awareness. They start to use games and programs on these devices naturally and this procedure is not learning but acquisition, as they are surrounded by ICT constantly.

This feature is a huge treasure for language teachers, and as I think they should draw profit from this to have better results in second language teaching. There is a considerable amount of literature on the investigation of written and spoken bilingual processing with its positive and negative aspects. Later in this paper I focus only on written language processing. My two research questions are: (i) Is it always the L1 that gets activated sooner and better? and (ii) What language gets activated when interlingual homographs appear? My hypothesis is that in anagram solving the possible combination of letters activates the dominant language, which is Hungarian, in our case. Therefore, I carried out a bilingual written word recognition test with anagrams. This paper is a preliminary attempt to see how the two languages become activated and what the influencing factors of this activation are.

## Literature Review

### *Pros and cons on bilingualism*

Few researchers have addressed the problem of significant factors that justify the Bilingual Advantage (BA). Bilingual advantage is the experience of using two or more languages. The bilingual brain is more resistant to Alzheimer disease and it is structurally

different from the monolingual brain. Bilingual students, on average, outperform monolinguals and bilingual adults have social and personal advantages, such as more and better career opportunities and higher salaries. In general terms among the bilingual advantages we want to emphasize creativity, logic and flexibility in thinking and greater metalinguistic awareness. Bilinguals are better learners of new languages (Bialystok, 2004). For children the Bilingual Advantage provides facilitation in verbal memory and for adults it confirms delayed onset of dementia (Alladi et al., 2013).

In specific terms, bilinguals have better executive functions as supported by Simon tests, Flanker tests and go/no go tests. On the other hand, bilingualism may have disadvantages as well, because bilinguals are slower in lexical decisions, semantic fluency and worse at solving simple mathematical problems. In the bilingual brain there are two languages that are constantly active and involved in additional processing cost. Their verbal skills are generally weaker than monolingual speakers' (Bialystok, 2004). Bilingual speakers know fewer words of semantic categories in either of their languages, in comparison to monolinguals. Their vocabularies are smaller and they cope with more 'tip of the tongue' features than monolinguals (Bialystok, 2004).

### Word recognition

Word recognition is the most important constituent process of language comprehension. In a narrow sense, recognition refers to the moment a match occurs between a printed word and one of the orthographic word forms stored in the lexicon (De Groot, 2011). It is impossible to understand reading and writing without word recognition and identification. It is the basis of teaching reading and writing in L1 and L2, so the relevance of this topic must not be neglected. Word recognition is the basis of semantic and grammatical comprehension processes. The complete knowledge of a word's meaning involves its referential meaning and intentional meaning as well (De Groot, 2011). Word recognition and morphological processing are connected, as it is shown in word recognition, lexical decision and naming tests (Pléh & Lukács, 2014).

The orthographic depth indicates the degree to which a written language deviates from simple letter-phoneme correspondence. It depends on how easy it is to predict the pronunciation of a word based on its spelling: shallow orthographies are easy to pronounce based on the written word, and deep orthographies are difficult to pronounce based on how they are written. The influencing factors of word recognition are varied: word frequency, familiarity, word superiority effect, context, quality of stimulus, word length (Lengyel, 1997). In the scientific literature more linguistic and non-linguistic factors are mentioned, which can also have significant effects on word recognition as a process: CV structure, motivation, vocabulary size, metalinguistic awareness, visual representation of a word, language attitude, linguistic typology, time of exposure, educational level, language, writing system, age and experiences in reading.
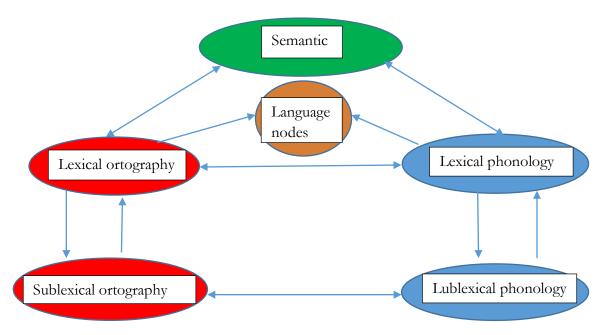
### Bilingual written language processing

Bilingual written language processing is much more complex than monolingual. The activation levels of the two languages may cause delays, accelerations or have no effect at all. The acquisition of the written forms of languages is influenced by the types of the writing systems. The acquisition of two similar writing systems results in acceleration, while that of two different systems have no effect on each other (Bialystok, 2004). How the two languages are activated at the word level, i.e. how visual processing or word recognition takes place in the bilingual mind has been a question for a while. There have been different models constructed so far that describe the proposed bottom-up or top-down processing. The bottom-up models suppose that information processing is modular, from lower levels to higher (features, letters, graphemes, syllables, morphemes, lexical entries). Connectionist models, on the contrary, propose that activation and processing is going on with the involvement of different levels at the same time, and these levels are in interaction.

BIA+ model (Dijkstra & Van Heuven, 2002) is an illustration for an interactive model of how bilingual visual word recognition is going on. According to this model, there are two subsystems: the word identification subsystem and the task/decision subsystem. The study on word identification subsystem resulted in that visual representation of a word influences word processing (integrated lexicon), both potential word choices are activated (nonselective access), bilinguals' language proficiency is lower in L2 than in L1 and the activation of L2 lexical representations will be delayed. Task/decision subsystem concluded in, that there is no significant influence on activation of word identification (Dijkstra & Van Heuven, 2002).

**Figure 1.** *Testing linguistic creativity and language activation with anagrams*

In literature anagram' is defined" as a word or phrase that is made by arranging the letters of another word or phrase in a different order." For example an anagram of "Elvis" is "lives". Creativity in making up words from letters seems to be a key factor. Anagrams have a significant role in speech science, specifically in investigating aphasia. The Northwestern Anagram Test (NAT) is a specific type of anagram solving, measuring sentence production in primary progressive aphasia so it has scientific significance. Mayer (1983) found that the influencing factors of anagram solution for 5 letter long anagrams were word frequency and frequency of specific letter combinations (*train, enjoy*). Cases with less movement of letters are easier, whereas wordlike anagrams are more difficult to change. If you have experiences in problem solving it is easier to recognize anagrams if the words are in one semantic field (Mayer, 1983).

The present study intended to explore the word creating creativity of Hungarian learners of English, i.e. the Hungarian-English bilingual lexicon. I undertook this research to see how the two languages (Hungarian and English) get activated in a specific word recognition test in Hungarian learners of English. As opposed to natural bilinguals, who are exposed to both of their languages in their everyday life, instructed bilinguals use their L2 mostly in education. The difference due to the amount and manner of exposure for natural and instructed bilinguals may cause differences in the activation processes. These factors may have an influential role on the phonological, orthographic and semantic awareness as well. Based on what the literature suggests, I suppose that for the instructed learners their L1 will be more successfully processed. I am also eager to see whether word creating creativity does play any role in word processing. First of all, I would like to highlight that Hungarian is a non Indo European language, which uses the Latin alphabet. Moreover Hungarian is an agglutinating language, in which we modify the meaning of the words by suffixes and endings.

There are specific properties of the language, which may have effects on word recognition, as we have 9 diagraphs and 7 pairs of long and short vowels. At the beginning of words, letter transitional probability is not allowed/accepted. On the contrary, in English it is frequent, and there are no diacritics on vowels. Most of these factors are based on the grapheme phoneme identification.

**Methodology**

*Participants*

Sixty participants (55 males, 5 females, mean age: 15 years, attending the same secondary school in Hungary) completed and returned the questionnaire. The number of males is pretty high, because in the school the taught trades are mainly for men, such as engineering, car mechanic, painter, body mechanic and turner.   Out of the sixty participants 10 had corrected to normal eyesight. I had a written agreement from the parents and from the school. Taking the test was voluntary in the school and was carried out in a stress free

condition. There was no time limit for the participants of the test, which took place on a school day afternoon after the regular classes. All the participants come from monolingual Hungarian families. Some of the parents speak and use foreign languages but they claim they are monolingual. 72% of the parents have secondary school certificate.

The participants go to the same secondary school, but they differ in terms of exposure to English: 72% of them have four and 28% have two English lessons per week. According to their competence all the participants are Hungarian dominant bilinguals, use Hungarian as their mother tongue, while L2 is English, which they use at school and sometimes at home. 85%, so most of them is early and 15% is late bilingual (11 years was defined as border line in terms of the onset of SLA). "… early acquisition of one language recruits expected temporal regions involved in perceptual processing, whereas early acquisition of two languages increases the engagement of prefrontal regions involved in working memory to process L2 speech sounds. Furthermore, the results suggest that bilingualism can serve to counteract the negative effects of low socioeducational environments on cognition and that late bilinguals may be using more selective attention (posterior areas) than early bilinguals to process L2 speech sounds. Therefore, AoA appears to play an important role in L2 speech processing that is tied to SES and proficiency level in the second language" (Archila-Suerte et al., 2015).

### Procedure and materials

A socio-economic, a language attitude, an ICT, a language aptitude and a motivation questionnaire were provided first for the participants, and after the completion of the questionnaires, there was an anagram solution test. This method was chosen because this is one of the most rapid ways to get answers form teenagers. With respect to the visual representation of the test, it was printed and photocopied; text was 12, Times New Roman. The questionnaire on the socio-economic status contained 20 questions, such as the educational level of the parents, the parents' jobs, whether the participants have their own room, their own TV set and mobile phone; whether they go to private language lessons, whether they travel abroad, go to the cinema and/or theater, etc.

30 questions were related to the participants' linguistic repertoire: their L1, L2, their parents' mother tongue and second language, which language is easier for them, which one is the preferred language, what is their proficiency level, their reason of learning English, reading habits, manner of language acquisition, their opinion about the advantage/disadvantage of bilingualism, etc. 40 questions made up the info-communication technology test. I was interested in the participants' habits, such as, which is the most frequently used function on your mobile phone? How old were you when you got a mobile?"

In order to get a more detailed picture of my participants, I applied the Llama language aptitude test, as the ability for foreign language seems to be crucial in the present study. Attitude motivation test battery was also used to deepen the knowledge about the

students' background. This factor is significant in scientific literature. Gardner and Lalonde defined motivation in 1985 as a desire to reach the aim of language learning.

### Anagram test

A specific anagram based word recognition test was administered, with 30 letter strings consisting of 3-4 letters. When creating these letter strings, I used the students' books as a source of knowledge and information. From the given 3-4 letters both English and Hungarian meaningful content words were possible to create, but participants had to write only one word, which came first to their minds. It is essential to emphasize that some of these words were Hungarian–English interlexical homographs: (e. g., *tan*) which means two orthographically identical words that not necessarily sound the same and that have different meanings and origins. All the words were checked for familiarity and word frequency in the two corpora. As a source of English, COCA (Corpus of Contemporary American English) was used, while the basis for the Hungarian language was the HNC (Hungarian National Corpus). All the possible creations of words are in the first 60.000 in both corpora.

The anagram task was formulated in both of the languages to avoid effects of the language of the instruction. The task was as follows: In what language can you make a word from these anagrams? Write the first word you recognize in the column of the appropriate language. Participants had to indicate their answers by writing the meaningful word they recognized first in the appropriate column of the language.

**Chart 1.** *Sample of the anagram test*

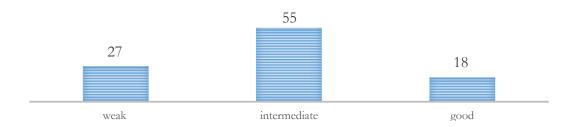| Hungarian word | Anagram | English word |
|---|---|---|
| | 1. amla | |
| | 2. dda | |
| | 3. ickk | |
| | 4. enm | |
| | 5. emes | |

### Findings

I examined the factors which were relevant in the literature too, to explore the participants' socio-economic status and linguistic repertoire. The parents' educational level is an important factor, as Bialystok (2004) determined it; in my study, the mothers' and fathers' educational levels were similar: the majority had secondary school certificates. Most of the parents have job as factory workers. Focusing on the students, it was clear that most of them have their own room in their home, some of them with an own TV set. They own mobile phones, but on the contrary, only a few of them can afford to travel abroad or go on a

holiday. Based on these, we can say that they come from lower middle class families. This factor may be an answer to their poor results in specific tests.
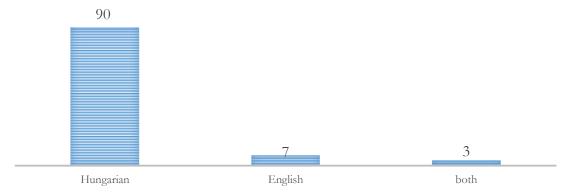
In 2013, Lipina et al. found that individuals who come from higher SES backgrounds are better in fluid processing, attention control and working memory than those individuals who come from lower SES (Archila-Suerte et al., 2015). Considering the results of the language attitude test it is important to maintain that the parents' first language is Hungarian, and the second language (if they speak a second language at all) is German.

**Figure 2.** *Participants' proficiency level of English, according to their self-evaluation*



Most of the students answered that they are at an intermediate level of English (Figure 2), probably based on their school results. Some of them have a B2 level language exam in English as well. Only a few of them evaluated themselves as good language users. Probably these are the students who are the most successful in the English lessons.

**Figure 3.** *Participants' reading habits regarding languages*
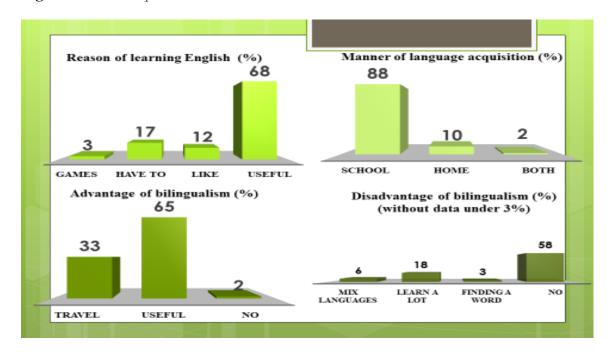


They do not use English as frequently as Hungarian in their everyday life, out of school. When they read books, they use their mother tongue (Figure 3). If English is used, it happens during playing computer games or they chat in this foreign language on their computers, using chat programmes. To sum up, they used English during free time activities with ICT devices out of school.

**Figure 4**. *Frequency of English usage among participants*



Participants use English on a regular basis at school and sometimes out of it (Figure 4). At school, the number of English lessons are different (varies from 2 to 4 a week), out of school some of them use it for basic communication but only through an ICT device. If they are abroad they use it only when they are addressed. There are no other options for foreign language usage.
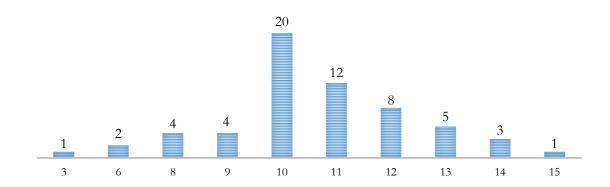
**Figure 5.** *Some example answers*



Considering the reason of learning foreign languages and the manner of acquisition, participants are aware of the importance of speaking a foreign language and they learn it

instructionally. Most of the students find English language easier than Hungarian, and they prefer English, as it is more modern to use nowadays. They think bilingualism is really useful and it has no disadvantages (Figure 5). It is only a slight problem that they have to learn a lot to be good language users.
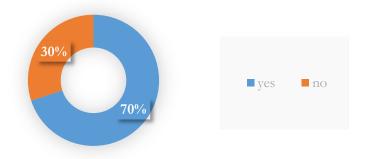
In the Info Communication Technology test I tried to focus on the usage of mobile phones, because this is a status symbol for secondary school students. All of them have got a mobile and they use it in various spheres of life. The time of usage is increasing in an unbelievable way.

**Figure 6**. *Age of having an own mobile*



This figure had one of the most striking effects. Most of the students got their first mobile phone at the age of ten, but there is someone who got it at the age of 3. At that time children are not able to use this instrument independently. As it is not clear what is it good for at that time i think it was only a status symbol.
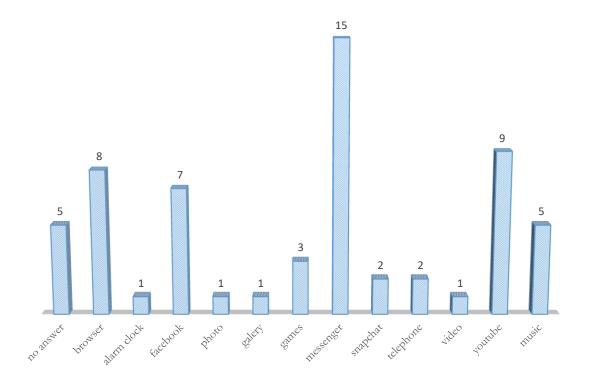
**Figure 7**. *Answers for the question of helping function of mobiles in learning*

This question was necessary in my interpretation. In Hungary, nowadays mobile phones are strictly forbidden in education. Students are not allowed to use their phones during school lessons irrespective of the usefulness of it. On their phones kids would be able to search for information, listen to right pronunciation of words in foreign languages, listen to their favorite songs and their lyrics just to mention some of facilitating effects of motivation for language learning.
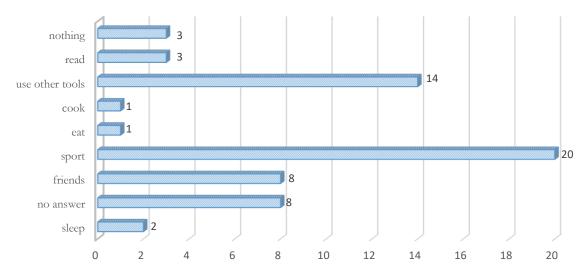
Participants answered in 70 % that they do use mobile phones when they learn outstanding number. In secondary education the usage of mobile phones should be retraced. At the age of 14-15 children are able to use this instrument with the sense of responsibility.

**Figure 8**. *Most frequently used function of mobiles*



The repertoires of functions are varied. Messenger, youtube, and the internet browser are the most popular functions. This data must be considered in education and as teachers we should draw profit from this phenomenon in the 21st century. If we accommodate to the ICT needs of our students, it will be easier to raise their interest and motivation.

**Figure 9.** *Activities without a mobile phone*



Without their mobile phone, they would do some kind of sport activity, or they would use other ICT devices.
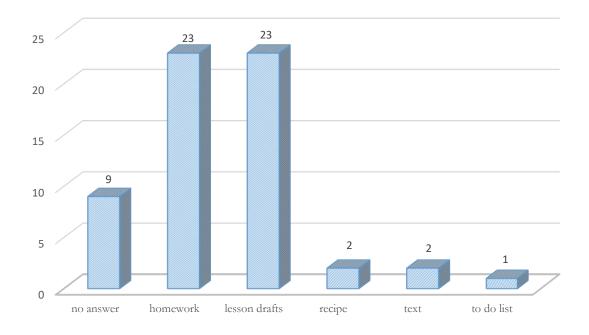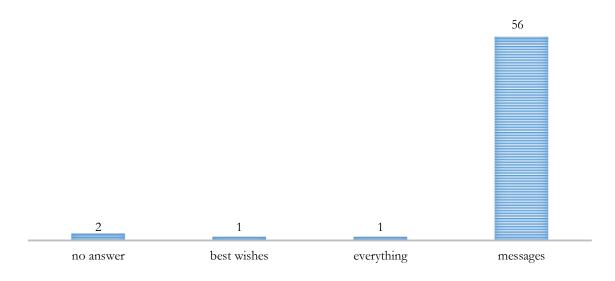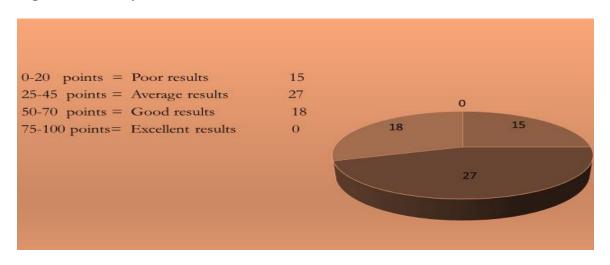
**Figure 10.** *Handwriting*
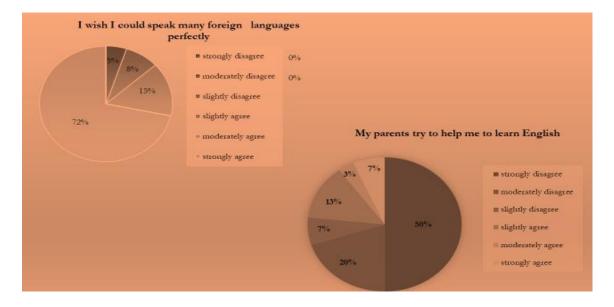
**Figure 11.** *Writing by phone*



Having seen figure 10 and 11 it is absolutely clear that children totally got accustomed to mobiles. They mostly communicate by text messages on their phones. Handwriting is vanishing among secondary school students, as they practice it only in school context.

**Figure 12**. *Results of the Llama test*



The language aptitude test had the following results: out of the 60 participants, 15 students had poor results, 27 average results, 18 good results and 0 excellent results.

**Figure 13**. *Some results of the AMTB test*



The most remarkable answers are: that 43% of the participants strongly disagree with the statement: "I do not pay much attention to the feedback I receive in my English class." 47% strongly agree with: „I look forward to going to class because my English teacher is so good." All in all we can say that students are aware of the importance of language knowledge and they would like to speak more foreign languages perfectly. Teacher has a highly important role in the language learning procedure and in motivation as well. 28% the English teacher is better than the other teachers, and most of the students would spend more time on English lessons than on other lessons, as they enjoy English classes' activities more than other lessons'. 28% of the participants acknowledge that foreign language is important for their career, but only 11% is able to neglect the disturbing factors during language learning.

### Findings of the anagram test

In some cases, participants created the words that were well known and frequent. The most frequent words came first in their dominant language. However, the most striking result to emerge from the data is that they recognized some homographs sooner not in their mother tongue, but in their second language. My particular interest is based on the reason behind this. From the several possibilities there were some cases in which students did not recognize all the words they could have, such as in the case of anagram 'arb'. This test revealed that there was no occurrence of recognized words like *bra*, or *ate*. Past forms of verbs were exceptionally rare, anyway.
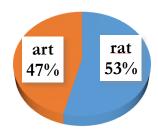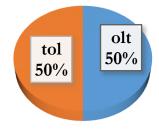
**Chart 2.** *Example answers in the anagram test*

| Hungarian word | Anagram | English word |
|---|---|---|
| rab | 13. arb | bar;    bra |
| tea | 22. aet | eat;    tea;    ate |
| tar | 26. atr | rat;    art |

From the three letters 'arb' it was possible to create *rab* in Hungarian ('prisoner' in English). In English two words were possible; *bar* and *bra*. However, *bra* did not appear at all. *Bar* appeared in 100% of cases in the English answers. Checking the word frequencies of the related words in the corpora of the two languages, I could find that in COCA, *bar* is 15,7 times more frequent than *bra*, which supports the result. From the letters 'atr' it was possible to create 3 words: *tar* in Hungarian ('bald' in English) and *art* or *rat* in English. The two English words came up in a nearly similar percentage. This result contradicts the results of frequency in COCA, as *art* is twice as frequent as *rat*. In our data, they are represented in nearly 50-50%.

**Figure 14.** *English words from 'atr'*        **Figure 15.** *Hungarian words from 'tlo'*



Hungarian answers illustrate that in some cases the answers came up in the same percentage. All in all, in Hungarian *tol* ('push' in English) came out in 50% as it happened with *olt* ('extinguish'). *Lot* appeared in the same percentage as an English word. Regarding the frequency of these words, there is a huge difference: *tol* is 1.9 times more frequent than *olt*, but among the Hungarian answers these words appeared in the same proportion (Figure 15).

### Parts of speech occurrences

Regarding parts of speech (Figure 16), nouns were most frequently used (76%), then came verbs (15%) and adjectives (5%). Three percentage of the answers were adverbs and one – attributes.

**Figure 16.** *Parts of speech in the answers*



Many more words were recognised in Hungarian (L1) than in English (L2) (Figure 17). Nearly twice as many Hungarian words were created by the end of the test.

**Figure 17**. *Total number of anagrams in Hungarian and English in the test*



**Discussion**

There were surprising results regarding homographs (see Figure 18 and 19). Despite the participants' linguistic background these words were recognised as English in an unexpectedly high proportion. Tan is a homograph, as it is a meaningful content word both in the Hungarian ('a kind of doctrine') and English (denoting a skin colour) languages. Ant (which is not a homograph) was possible to create too. These data are in harmony with the results of the frequency rate in both languages. Tan is much more frequent in Hungarian than tan in English and this result is the same in the test.

**Figure 18.** *Answers for anagram "atn"*

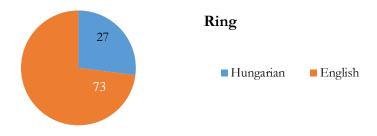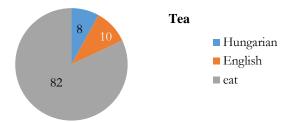**Figure 19.** *Answers for anagram "ingr"*



**Figure 20.** *Answers for anagram "aet"*



'Ingr' triggered unexpected answers. A homograph ring can be made from the letter string, having different meanings in both languages, and the word is more frequent in Hungarian than in English as it has two meanings (it is a noun and a verb). However, it was recognised as an English word in 73%. Homograph tea appeared in both languages in a nearly similar percentage (Figure 20), but the anagram was recognized as verb eat in a higher number. This was unexpected as nouns are more frequent on the average than verbs. 'Top' was the most significant signal of word frequency effect. It is 1,45 times more frequent in English than in Hungarian according to the data of the two corpora. In my own test, the result was 4, 53 times more frequent in English than in Hungarian.

### Conclusion and implications for further implementation

My work has led me to conclude that word frequency effect is more determining, than language proficiency level in bilingual visual word recognition. My two research questions were: (i) Is it always the L1 that gets activated sooner and better; and (ii) What language gets activated when interlingual homographs appear? For the first question the answer is no. Having the example ring we can see that for the participants it was an English word in73 and a Hungarian word in 28%. In case of homographs the results are in line with

the previous ones, so not Hungarian language was always the dominant. Taking my hypothesis into consideration (In anagram solving the possible combination of letters activate the dominant language, which is Hungarian, in our case) we can determine that sometimes L2 (English language) becomes dominant in anagram solving activities.

The most striking result to emerge from the data is that despite of the instructed foreign language learner state of the participants, some of the interlexical homographs were recognized not in the mother tongue but in the foreign language. This is unexpected, as the English language proficiency of the participants is much lower than the Hungarian one. In the cases where more options were possible to create from a letter string, the more frequent words came first. These are significant factors and prove that word frequency is more important in word recognition than language proficiency. In the future, I would like to expand this test for further incoming 15 year old students in the original school. Moreover I plan to investigate the results of other students from different types of schools and linguistic backgrounds to have control groups.

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**Biographical notes**

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