

BİLİŞSEL SÜREÇ VE İKİNCİ DİLDE KELİME ÖĞRENMENİN ANALİZİ

ANALYSIS OF THE COGNITIVE PROCESS AND SECOND LANGUAGE VOCABULARY ACQUISITION

Abdullah PAMUKCU*, Azamat A. AKBAROV**

ÖZET: Dil bilim çalışmaları dilin doğası, yapısı ve bilişsel süreçler üzerine odaklanmıştır. Sözü edilen kavramlar, dilin nasıl edinildiğini açıklamaya çalışmışlardır. Araştırmacılar için dil edinimi çok önemli bir kavramdır. Araştırmacılar için önemli bir kavram olan kelime edinme, fonolojik bellek becerilerinde öğrenme sürecinde önemli bir rol oynadığını göstermiştir. Bu çalışmamızda, iki yabancı dil öğrenen 149 öğrenci üzerinde kendi ana dillerinin ikinci dilde kelime edinimi üzerindeki etkisini incelemeye çalıştık. Ana dil ve yabancı dildeki kelime bilgisiyle kısa ve uzun süreli bellek arasında karşılıklı sağlam bir ilişki olduğu ölçülmüştür. Bu çalışma Sarajevo uluslararası okulunda yabancı dil olarak iki dil öğrenen 149 (24 İngilizce, 99-Boşnakça ve 26-Türk) ergenin kısa ve uzun süreli hafıza becerileri ve yeteneklerinin yabancı kelime edinimine etkileri araştırıldı. Ana dil ve yabancı dil kelime bilgisinin fonolojik kısa-uzun süreli bellek ile karşılıklı olarak önemli ilişkileri bulunmaktadır.

Bu makalede teorik çerçeveler içinde ergenlerde bilişsel ve dilsel süreç etkilerini, çalışan bellek, fonolojik döngü, ana dil bilgisi, yaş ve iki dilli çevrenin etkilerini vurgulayarak yabancı kelime edinimi analiz edilmeye çalışıldı.

Anahtar sözcükler: seslendirme döngüsü, hafıza, çift dilli, ergen

ABSTRACT: Studies of linguistics have focused on the nature and structure of language, and the process of cognition. With mentioned notions studies have attempted to explain how language is acquired and learned. Vocabulary acquisition has been the major concept for researchers who have consistently demonstrated that phonological memory skills play an important role in the learning process. In this study the researcher analyzed vocabulary acquisition with 149 students, who have been learning two languages, apart from their first language, we try to find out effect of the native language on the learning of second language vocabulary acquisition. This study with one hundred forty nine (99-Bosnian, 24-English and 26-Turkish) adolescent who learn two languages as a foreign language investigated the effects of short and long term memory skills and adolescent's abilities on L2 vocabulary acquisition at the International School of Sarajevo. Knowledge of native and foreign vocabulary has a mutual high significant the relation with phonological short-long term memory measures.

This paper analyzed the effects of the cognitive and linguistic process underlying foreign vocabulary acquisition in adolescences within the theoretical frameworks of working memory and phonological loop by testing the influence of native-language knowledge, age, and the bilingual environment.

Keywords: Teaching Turkish as a foreign language, speaking skills, assessment and evaluation.

*Sarajevo International School, Felsefe Bilim Dalı, pamukcu74@hotmail.com

**Ph.D., International Burch University, Sarajevo, Bosnia and Herzegovina, azamatakar@yahoo.com

INTRODUCTION

Over the last five decades, growing cultural and linguistic diversity, cross-cultural contact, and recognition of the cultural differences have raised interest of studying language. Not only environment factors but also innate factors turned the face of language frameworks from structural to a cognitive perspective. Behaviorism explains how a person learn the regular aspects of language. Later on, Chomsky challenged the behaviorist theory for language learning. The Cognitive perspective offers innate learning (universal) principals. Chomskian tradition 'has focused on questions of how words are put together into sentences rather than on the words themselves' (Gleitman & Fisher, 2005).

Moreover in 2006 one of the European Commission's survey showed that 56 percent of participants reported being able to speak an additional language along with their mother tongue. In many countries that statistic is even higher—for instance, 99 percent of Luxembourgers and 95 percent of Latvians speak more than one language. So bilingual environment and L2 studies have increasingly turned towards cognitive. The growing interests in L2 learning involved in the study of attention, memory, pattern recognition and other cognitive topics (Solso, 2001).

This study recapitulates and clarifies literature using a consistent data sets and methodologies. It establishes the effectiveness of, working memory, phonological memory and vocabulary acquisition in adolescent English, Bosnian, and Turkish as a second language in a bilingual environment.

The present study analyzes the relationship between phonological memory and L2 vocabulary acquisition for learners' linguistic experiences over the school year. Both receptive and responsive vocabularies were measured to observe the possible impact of short term memory with different aspects of L2 vocabulary knowledge.

Processes and Stages of Memory

There are many hypotheses and suggestions that explain how brain integration occurs in memory. Memory is the process by which we collect prior information experiences learned in the past. Recently, however, many researchers have adopted the hypothesis that memory consists of a number of systems and subsystems with different operating characteristics. Atkinson and Schiffrrin's (1968) model was a dominated model of memory functioning within cognitive psychology. Atkinson and Shiffrin (1965, 1968) introduced the so-called "two-store model" of memory. It proposed a distinction between a temporary Short-Term Store (STS) and a more permanent Long-Term Store (LTS).

Researches of brain damaged patients and neuropsychological studies showed evidence of three kinds of memory which contains events, general knowledge, and skills. Schacter and Tulving (2001) stated that "a memory system is defined in terms of its brain mechanisms, the kind of information it processes, and the principles of its operation" (p. 283). This suggests that memory is the combined total of all mental experiences. Eliasmith (2001) defines memory as the "general ability, or faculty that enables us to interpret the perceptual world to help organize responses to changes that take place in the world" (p. 1) In this light, memory is a built store that must be accessed in some way in order for effective recall or retrieval.

In addition memory has three different stages, episodic, semantic and procedural memory. Episodic memory is related with the specific event. The event took place in individual's presence, and the individual experienced. "What you ate for lunch yesterday, result of your last test" are examples of episodic memory. Semantic memory is related with facts, words, and concepts. Language and meaning of the word are examples of semantic memory. Unlike

episodic memory, acquired information is not remembered in our semantic memory. Procedural memory is one of the long-term memory. Procedural memory is creation of repeating a complex activity that occurs over and over again. Till all of the relevant neural systems work together procedural memory automatically produce the activity. Procedural memory is essential for the development of any motor skill or cognitive activity.

Short term and Long term Memories

After information enters the brain, it has to be stored or maintained. To describe the process of storage, many psychologists use the three-stage model proposed by Richard Atkinson and Richard Shiffrin. According to this model, information is stored in three memory systems: sensory memory, short-term memory, and long-term memory.

Sensory memory is the first step of information storage which consists of immediate, initial recording of data that enter via our senses. Sensory memory stores incoming sensory information in detail but only for an instant. The capacity of sensory memory is very large, but the information in it is unprocessed. In early studies in literature, memory was investigated under two basic categories those are short-term and long-term memories. Short-term memory was considered as different from long-term memory in the duration of the proceedings it held. George Miller, an early and influential cognitive theorist, provided detailed evidence that the capacity for short-term information storage is limited. The duration of short-term memory is believed to be in the order of seconds (Miller, 1956).

In contrast to short-term memory, the duration of long-term memory is assumed to be vast and much more long-lasting. Long term memory is (LTM) the third step of information storage. New information is constantly being transferred into long term memory that has far more information that includes pictures, words, sounds, smells, tastes, and touches. Storage in long-term memory is assumed to be primarily associative. Relating different items to one another and relating items to attributes of the current situation.

Bahrack (1975) investigated long term capacity which they called very long term memory (VLTM). In his study, nearly 400 participants aged 17 – 74 were tested. He tested different variables, including, a free recall test, where participants tried to remember names of people in a graduate class. Later on he tested a photo recognition test, which consisted of 50 pictures. Besides these one of the earliest and most influential divisions of long term memory was proposed by Tulving (1972). He proposed to show the distinction between episodic, semantic and procedural memory. Nowadays the term ‘long-term memory’ is reserved for memory of experiences that occurred at a point in time prior to the immediate past or near present, and he mentioned knowledge that had been acquired over long periods of time (Gathercole & Alloway, 2008).

Working Memory and Phonological Loop

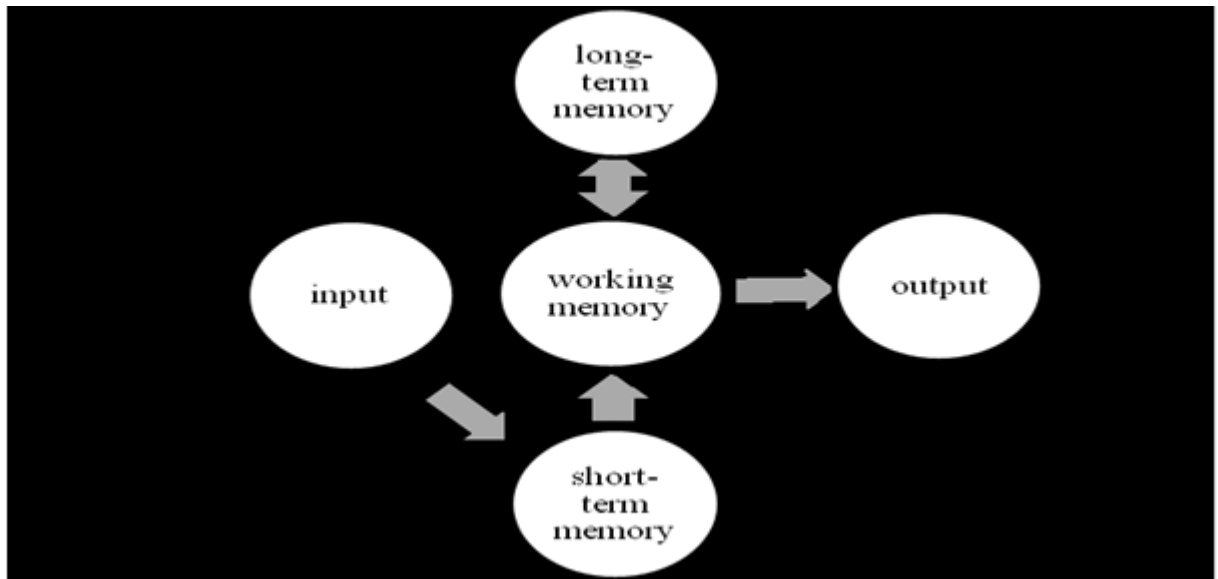


Figure 1. Input-Output Model of Memory Source: Kelly and Phillips, 2011

Working memory (WM) is a larger system of which short-term memory (STM) is a part. Working Memory refers to structures and processes. It is used for temporarily storing and manipulating information. The process of working memory are described as a combination of the central executive part. Working memory tasks are more complex activities that involve not only the storage of information, but also either its mental transformation or being engaged in some other effortful mental process.

Working memory is presented as having a vital role in storing information in our short-term memory. Working memory holding information to act on it and in both the storage and retrieval of information from our long-term memory (Kelly and Phillips, 2011). This is demonstrated in the input-output model (see Figure 1) of Kelly & Philips (2011).

Under the working memory system there are three sub-system. The three subsystems include the articulatory or phonological loop which handles verbal, acoustic information, the visual-spatial sketchpad involved in the short-term processing and maintenance of material having a visual or spatial component. Experimental and neuropsychological research results show that language and memory combination system has a strong relation with phonological loop which is the phonological buffer of language processing. The phonological loop is essential and the part of working memory that supports spoken and written material. Phonological loop gets information like a tape loop. This is how we remember a telephone number we have just heard. As long as we keep repeating it, we can recall the information in working memory. The capacity of phonological loop was typically assessed by a set of serial recall tasks which involved digits or words. The phonological loop had been suggested to play a key role in vocabulary acquisition, especially during early childhood years (Baddeley et al., 1998). The phonological loop is an important concept, in first and second language vocabulary acquisition.

Research on Second Language Vocabulary Acquisition

Over the last five decades, the concepts of specific neural networks that support specific mnemonic processes became the essential phenomena for the field of psychology. Psychological doctrines have influenced to language learning studies. The mutual relations between cognitive process and vocabulary acquisition is one of them. Researches of L2 and vocabulary acquisition has been influenced by different perspectives for instance, vocabulary size (Waring & Nation, in Schmitt & McCarthy, 1997), receptive and productive vocabulary (Melka, in Schmitt & McCarthy, 1997).

Later on, vocabulary learning has been the major concern of a number of researchers who have consistently demonstrated that phonological memory skills play an important role in the learning items. Not only young and children their L2 learning but also LI that has a relation with the possible involvement of the phonological loop (or phonological memory) in vocabulary learning (e.g., Gathercole & Adams, 1994; Gathercole & Baddeley, 1989; 1990; Gathercole, Willis, & Baddeley, 1991; Gathercole, Willis, Emslie, & Baddeley, 1992) or an L2 or foreign language (FL) (e.g., Baddeley, Papagno, & Vallar, 1988; Cheung, 1996; Service, 1992; Service & Kohonen, 1995).

One of the most influential models of memory has been developed by Baddeley (1986, 2000, 2003a, 2003b). The phonological loop plays an important role while learning new words. The phonological or articulatory loop subcomponent of working memory is responsible for acoustic or speech-based information. Moreover, according to Baddeley phonological retention capacity plays the crucial role in foreign language vocabulary learning (Baddeley, 1998).

In particular, phonological memory was found to strongly predict children's vocabulary acquisition (Baddeley, Gathercole & Papagno, 1998) and may play a vital role in learning LI vocabulary in preschool children (Gathercole, Willis, Emslie, Baddeley, 1992). Other studies reported that children with better phonological memory skills produce longer and more complex sentences (Adams & Gathercole, 1995, 1996, 2000). Additionally, they have better abilities to learn new lexical items, recall new names, and learn new word definitions (Gathercole, Hitch, Service, & Martin, 1997).

Service & Kohonen (1995) obtained some similar results with Finnish children learning English as a foreign language with longitudinal study. They found direct evidence that the children's later success at acquiring English is mostly mediated by phonological memory and vocabulary acquisition. This advantage as well as the general vocabulary-learning advantage associated with cross-linguistic similarity (e.g., Ellis & Beaton, 1993; Gathercole, Willis, Emslie, & Baddeley; 1991; Papagno & Vallar, 1992; Service & Craik, 1993).

Thus, this is recognized to the association of working memory and phonological loop in the process of vocabulary acquisition. During the vocabulary acquisition process, if the foreign language matches in the duration of learning the native language, foreign-language information, (bilingualism), can be combined into the existing memory system with greater ease. Though, it remains unidentified what specific linguistic characteristics make foreign vocabulary acquisition easier or more difficult.

This study investigated the following questions,

Is there a significant correlation between phonological memory and vocabulary knowledge in serial non word recognition test?

Is there a significant correlation between duration of learning L2 with phonological memory and second language vocabulary acquisition?

Is there a significant correlation between age with phonological memory and second language vocabulary acquisition?

METHOD

Participants, Design and Procedure

Participants

In the International School of Sarajevo, there are 515 students. The sample, consists of 149 adolescents (ages 13-17 years) was randomly chosen from different classes and nations. The adolescents aged between 13 and 17 years, (17year 27students, 16 year 35students, 15 year 31students, 14 year 24students, 13 year 32students). They had been studying English, Turkish, and Bosnian on a regular basis for 3 years on average. Bosnian (99) students speak Bosnian, English (24) students speak English, and Turkish (26) students speak Turkish. Sex distributions of the participating adolescents are female 76, male 73.

At the beginning of the Serial recognition test, the Family Language Questionnaire was given to the participants and their parents to collect demographic information about the adolescents as well as other factors that influence the adolescents' first and second language development, such as country of origin, the age when L1 and L2 were learned, language use at home, and socioeconomic status. All adolescents were being taught English, Turkish, and also Bosnian as a foreign language by the teacher at their school. The mean period of study of English and Turkish were 3 academic years.

Design

Phonological memory tests are words or pictures that are the processing of a stimulus. These tests are particularly related with the repeating important words which refer to prior exposure to the same or a different stimulus. This study applied quantitative research approach providing that a researcher sets some predetermined questions to sample. Survey research is an especially useful approach when a researcher aims to gain some general details about one's population of interest to help prepare for a more focused in-depth study using time-intensive methods in field research. Serial non word recognition tasks (English, Turkish, Bosnian and Arabic) which is one of the common data collection methods in second language vocabulary acquisition, is used in this study. A task involving two sentences with brief retention interval is generally referred to as a short-term memory (STM) and long term memory (LTM) task.

Both serial non-word recognition results, and English, Turkish, Bosnian languages levels were longitudinally checked twice at the end of 1st and 2nd semester during 2014-2015 school years. L1 serial non word recognition test was checked for each languages (English, Bosnian, and Turkish) and each was compared to find out the correlation with L2 of others (English, Bosnian, Turkish) vocabulary acquisition. As the most of students do not know Arabic language, Arabic language is assumed to be main language that can show us exact differences of vocabulary acquisition. Not only simple and partial correlations as well as repeated measures of phonological memory test are used to find out the relationship among variables. These variables are age differences and languages of 149 students who have been learning two languages, apart from their first language which, effects of native language on learning of second language vocabulary acquisition.

For serial non word recognition, four sub-tasks were used: L1 Bosnian serial non words recognition test, L2 English serial non words recognition test, L2 Turkish serial non words recognition test and Arabic serial non words recognition test. The English serial recognition task

was administered first, followed by Bosnian, Turkish, and Arabic serial recognition tasks. The instructions were tape-recorded in Bosnian, English and Turkish (the learners' LI) and were given to the participants at the beginning of the testing session.

Stimuli were tape-recorded from the natural speech of a native speaker of English (for the English serial recognition task), Bosnian (for the Bosnian serial recognition task), Turkish (for the Turkish serial recognition task), and Arabic (for the Arabic serial recognition task). Following the second presentation, participants had to state whether the two presentations had been the same or different.

Examples of auditory stimuli correct responses,

Niste nu ridici, dun ja dag.

Niste nu ridici, dag ja dun. "Different"

Loest ind frond wih stoff i frond.

Loest ind frond wih stoff i frond. "Same"

In this study the quantitative method was used to compare of the four languages serial non word recognition test results. We intended to firstly evaluate vocabulary knowledge was related across the four languages. Secondly this relationship could be explained simply in terms of the mediating influence of phonological short-term memory skills.

Data Analysis

The data were collected and coded into Excel then to SPSS statistical program for presentation, interpretation and analysis. The discussion revolves around the computed means and standardized scores in relation to the aspects and areas where second language vocabulary acquisition is produced: level of first language, (background knowledge), age, gender of stay in Bosnia and Herzegovina. The descriptive analysis of the findings is used in an attempt to answer what characterizes the participants' receptive vocabulary acquisition.

Table 1. Pearson correlation of Age effects on serial non word recognition

Age (17,16,15,14,13 years)	1				
Arabic serial non word recognition test result	.228**	1			
	0.005				
Bosnian serial non word recognition test result	-.181*	.221**	1		
	0.027	0.007			
English serial non word recognition test result	-.203*	.294**	.417**	1	
	0.013	0	0		
Turkish serial non word recognition test result	0.055	.278**	.313**	.339**	1
	0.504	0.001	0	0	

**Correlation is significant at the 0.01 level

(2-tailed).

*Correlation is significant at the 0.05 level

(2-tailed).Sig. (2-tailed)

Simple Correlations

Pearson correlation is a suitable to get the data for recognition and responses of four languages, to show the impacts of L1 to the results of L2 vocabulary acquisition. Four different languages recognitions and responses were completed in one session. It was observed that there is significant negative correlation, between English serial non word recognition test result (ESNWRT) and age differences ($r(149) = -.203, P < 0.013$). Bosnian serial non word recognition test result (BSNWRT) and age differences has also a negative correlation ($r(149) = -.181, P < 0.027$). As opposed to other languages recognitions and responses, no significant correlation were observed between Turkish serial non word recognition (TSNWRT) and age differences ($r(149) = .055, P < .504$). However, Arabic serial non word recognition (ASNWRT), as a (foreign) language was significantly correlated with all languages serial non word recognition measures ($r(149) = .228, P < .005$). In addition these between the results of tests, the highly significant

correlations were observed, ASNWRT and BSNWRT ($r = .221$, $P > .007$), ESNWRT and ASNWRT ($r = .228$, $P > .000$), TSNWRT and ASNWRT ($r = .278$, $P < .001$).

Table 2. Correlations of First Language and 1-Bosnian 2-English 3-Turkish 4-Arabic Serial recognition test results (First language effects on serial non word recognition)

Bosnian serial non word recognition test result	1			
		.0		
English serial non word recognition test result	0.406**	1		
		0		
Turkish serial non word recognition test result	0.274**	0.312**	1	
	0.001**	0	0	
Arabic serial non word recognition test result	0.181	0.291**	0.185	1
Significance (2-tailed)	0.028*	0	0.024*	

Significance of comparisons (p) is marked by asterisks next to the t values. Significance at $p < 0.01$ is marked by two asterisks **; significance at $p < 0.05$ is marked by one asterisk *.

Partial correlations

The partial correlations were calculated between each pair of measures of phonological memory and L2 vocabulary acquisition. This was meant to account for the possible effects of first language knowledge L1 on learning of foreign language. Serial non word recognition test was checked for each languages (English, Bosnian, and Turkish) and each was compared to find out the correlation with L2 of others (English, Bosnian, Turkish) vocabulary acquisition. As the most of students do not know Arabic language, Arabic language is assumed to be main language that can show us exact differences of vocabulary acquisition. .

Serial non word recognition score was significantly correlated with foreign serial non word recognition result. BSNWRT highly correlated result was found between ESNWRT ($r = 0.406$, $p > 0.00$). Significant correlation was observed between BSNWRT result and TSNWRT result ($r = 0.274$, $p = 0.001$). L1 background knowledge and English, Bosnian, Turkish vocabulary test results were highly associated with one another. During the gathering of data, it was found out that there is an impact of L1 vocabulary knowledge effects on foreign vocabulary acquisition.

Paired Samples Correlations

	N	Correlation	Sig.
Pair 1 ESNWRT & ASNWRT	149	.299	.000

Table 3. Comparisons of English language and Arabic Language serial non word recognition test

T-Test

A paired samples t-test was conducted to compare the mean scores in table 3. English language and Arabic Language serial non word recognition test are calculated by computing the

differences between the paired values. The comparison of English serial non word recognition test and Arabic serial non word recognition test results showed the confounding influences of L1 to phonological loop and learning foreign vocabulary acquisition. [$r(149) .299, p >.000$].

Discussion

The phonological memory research serves to understand the process of vocabulary acquisition. Especially, these studies tried to show the relations between L1 and phonological memory on L2 vocabulary acquisition. Short term vocabulary knowledge has a strong relationship with phonological loop, however long-term knowledge deliberately influences L2 vocabulary knowledge. Factors related to L1 vocabulary knowledge effect phonological memory which is involved in learning of new vocabulary structures awareness. (E.g. Gathercole, Willis, Emslie & Baddeley, 1991, 1992; Masoura & Gathercole, 1999, 2005). In the vocabulary acquisition there is a close relation between foreign words and phonology of the native language. Support of phonology of the native language lexicon in vocabulary acquisition depends on whether foreign word fits the phonology of native language or not. If the word fits in native language, it makes easier to acquire.

Moreover these results show similar evidence like Gathercole, the essential role of novel phonological phenomena in the short-term and long term store. (e.g., Avons, Wragg, Cupples, & Lovegrove, 1998; Gathercole et al., 1999; Gathercole & Baddeley, 1989; Gathercole et al., 1991; 1992).

Highly significant relations were found between adolescence's phonological memory skills, as assessed by serial non word recognition, and their knowledge of vocabulary in both native and foreign languages. So the previous studies outline associations' short-term memory and vocabulary knowledge (e.g. Gathercole & Baddeley, 1990; Michas & Henry, 1994). Preliminary correlation analyses suggest that native language vocabulary knowledge and phonological short-term memory influence adolescences' ability to acquire foreign words. The degree and the exact patterns of correlations between foreign word learning and cognitive measures depend on the structure of the foreign language (phonologically-similar vs. phonologically-different from the native language) and on the linguistic experience of the learners (monolinguals vs. bilinguals)

Furthermore it was found that knowledge of native and foreign vocabulary have extremely close relations in contributions of phonological short-term memory to long-term learning. An implication of ending that the extensive relationship between phonological loop and second language vocabulary learning has fully been covered in this article. For further researches, what factors that are needs in vocabulary acquisition and factors which are influenced for an individual's capacity for learning L2 vocabulary acquisition can be studied.

REFERENCES

- Atkinson, R.C., & Shiffrin, R. M. (1968). *Human memory: A proposed system and its control processes*. (pp. 89-195). New York: Academic Press.
- Baddeley, A.D. (1986). *Working memory*. Oxford: Clarendon Press.
- Baddeley, A.D., Gathercole, S.E., & Papagno, C. (1998). *The phonological loop as a language learning device*. *Psychological Review*, 105(1), 158± 173.
- Baddeley, A.D., & Hitch, G.J. (1974) *Working memory*. In G. Bower (Ed.), *the psychology of learning and motivation*, Vol.8 (pp. 47± 90). New York: Academic Press
- Baddeley, A. D., Papagno, C., & Vallar, G. (1988). *When long term learning depends on short-term storage*. *Journal of Memory and Language*, 27, 586-595.
- Baddeley, A.D. (2000). *The episodic buffer: A new component of working memory?* *Trends in Cognitive Sciences*, 4, 417-422.
- Baddeley, A.D. (2003a). *Working memory and language: An overview*. *Journal of Communication Disorders*, 36(3), 189-208.
- Baddeley, A.D. (2003b). *Working memory: Looking back and looking forward*. *Nature Reviews Neuroscience*, 4(10), 829-839.
- Baddeley, A. D. (1997). *Human memory: Theory and practice* (2nd Ed.). Boston: Allyn & Bacon.
- Cheung, H. (1996). *Non word span as a unique predictor of second-language vocabulary learning*. *Developmental Psychology*, 32(5), 867± 873.
- Gathercole, S.E., & Baddeley, A.D. (1989). *Evaluation of the role of phonological STM in the development of vocabulary in children: a longitudinal study*. *Journal of Memory and Language*, 28, 1± 14.
- Gathercole, S.E., & Baddeley, A.D. (1990). *The role of phonological memory in vocabulary acquisition: A study of young children learning new names*. *British Journal of Psychology*, 81, 439± 454.
- Gathercole, S.E., & Baddeley, A.D. (1996). *The Children's Test of Nonword Repetition*. London: The Psychological Corporation.
- Gathercole, S.E., Willis, C.S., Emslie, H., & Baddeley, A.D. (1991). *The influences of syllables and word-likeness on children's repetition of non-words*. *Applied Psycholinguistics*, 12, 394± 367.
- Gathercole, S. E., & Adams, A. (1994). *Children's phonological working memory: Contributions of long-term knowledge and rehearsal*. *Journal of Memory and Language*, 33, 672-688.
- Gleitman, L. R., & Fisher, C. (2005). *Universal aspects of word learning*. Cambridge University Press, 2005 p.123
- Gathercole, S. E., Willis, C.S., Emslie, H., & Baddeley, A. D. (1992). *Phonological memory and vocabulary development during the early school years: A longitudinal study*. *Developmental Psychology*, 28, 887-898.
- Gathercole, S. E., Hitch, G. J., Service, E., & Martin, A. J. (1997). *Phonological short-term memory and new word learning in children*. *Developmental Psychology*, 33, 966-979
- Gathercole, S.E., Willis, C.S., Emslie, H., & Baddeley, A.D. (1991). *The influences of syllables and word-likeness on children's repetition of non-words*. *Applied Psycholinguistics*, 12, 394± 367.
- Eliasmith, C. (2001); *Minds and Machines*. Oxford University Press, 2001
- Ellis, N.C., & Beaton, A. (1993). *Factors affecting the learning of foreign language vocabulary: Imagery, keyword mediators and phonological short-term memory*. *Quarterly Journal of Experimental Psychology*, 46A, 533± 558.
- Miller, G. A. (1956) *The Magical Number Seven, Plus or Minus Two: Some Limits on our Capacity for Processing Information*, Harvard University
- Papagno, C., & Vallar, G. (1992) *Phonological short-term memory and foreign language vocabulary learning*. *Journal of Memory and Language*, 30, 33 1-347.
- Service, E. (1992). *Phonology, working memory and foreign language learning*. *Quarterly Journal of Experimental Psychology*, 45A, 21± 50.
- Service, E., & Kohonen, V. (1995). *Is the relation between phonological memory and foreign language learning accounted for by vocabulary acquisition?* *Applied Psycholinguistics*, 16, 155± 172.
- Service, E., & Craik, F. (1993). *Differences between young and older adults in learning a foreign vocabulary*. *Journal of Memory and Language*, 32, 608± 623.
- Solso R. L. (2001). *The Science of the Mind*. Oxford University Press
- Tulving (1972) Tulving, E. (1972). *Episodic and semantic memory*. In E. Tulving & W. Donaldson (Eds.), *Organization of Memory*. New York, NY: Academic Press

Waring & Nation, in Schmitt & McCarthy, *Vocabulary: Description, Acquisition* Cambridge University Press 1997