



**SHEIKHBAHAE UNIVERSITY**

SCHOOL OF FOREIGN LANGUAGES

**THE ROLE OF PHONOLOGICAL MEMORY  
IN THE DEVELOPEMENT OF LEXICAL AND  
GRAMMATICAL ABILITY:A STUDY OF  
IRANIAN EFL LEARNERS**

A THESIS SUBMITTED IN THE PARTIAL FULLFILMENT  
OF THE REQUAREMENTS FOR THE DEGREE OF  
MASTERS OF ARTS IN TEACHING ENGLISH AS A  
FOREIGN LANGUAGE

By  
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Supervisor  
DR. A. AFGHARI

FEBRUARY 2011



In the Name of  
God



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To:

My dear parents to whom I owe  
everything I have.

Dear Arash with whom  
everything is achievable.

And

My dear brothers without whom  
nothing was possible.

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**Abstract:**

This research investigates the role of phonological memory in the development of lexical and grammatical ability in Iranian EFL students. To achieve this goal, 60 participants were selected by conducting an Oxford Placement Test. Based on the results of the test; the participants were assigned to two different groups: intermediate level and advanced level of language proficiency. Then, students' phonological memory was measured using a non word repetition test. In the third step, seven pictures were shown to students to prompt them to speak. Their voice was recorded and a four minute extract was transcribed for each person. Later on, the transcriptions were analyzed in term of accuracy of free and bound morphemes and use of compound and complex sentences. Separate scores were assigned to each paragraph for each of the above factors. In the last step, the correlation between phonological memory scores and the scores obtained from analyzing the speech samples was separately computed for each level of language proficiency and, the correlation between phonological memory scores and obtained scores from Oxford Placement Test was computed to determine the correlation between students' level of language proficiency and phonological memory. The analysis of the data suggested that there was a statistically significant correlation between phonological memory and accuracy in using free and bound morphemes at both levels. Also, there was a statistically significant correlation between phonological memory and the use of complex sentences. However, there did not exist a significant correlation between phonological memory and the use of compound sentences at any of the levels. Phonological memory was significantly correlated with students' level of proficiency.

**Chapter One**  
**Introduction**

## 1.1. Introduction

There are many factors which affect second language learning. Motivation (Fan, 2003; Sanaoui, 1995), age (Birdsong & Molis, 2001; Johnson & Newport, 1989), and working memory capacity (Harrington & Sawyer, 1992; Sunderman & Kroll, 2009) are among the most famous ones. Phonological short-term memory capacity has also been emphasized as an important factor in first and second language acquisition (Gathercole & Baddeley, 1993; Service, 1992).

It is claimed that memory plays an important role in second language acquisition. Many scholars have investigated its role in language learning. Chastain (1988, 38) asserts that "the value of learning correlates directly with the amount of learned information that is stored in memory and the proportion of material one can recall". It is believed that learning has not taken place unless individuals can store, retain, and recall information (Chastain, 1988).

In one of the most contemporary theories of memory, two types of memories that are short term memory and long term memory have been identified. Short-term memory (STM) is the capacity for holding a small amount of information in mind in an active, readily available state for a short period of time. Estimates of short-term memory capacity limits vary from about 5 to about 9 items, depending upon the experimental design used to estimate capacity. A commonly-cited capacity is 7±2 elements (Carroll, 2008). The duration of short-term memory (when rehearsal or active maintenance is prevented) is believed to be about a few seconds. In fact short term memory keeps the items until the new items take their place (Carroll, 2008). Short term memory is the center of all conscious cognitive processes (Chastain, 1988).

Working memory has been defined as "the temporary storage of information that is being processed in any range of cognitive task" (Baddely, 1986, 34). Baddely, has proposed a model of working memory which has been revised subsequently (Baddely, 1989-2002). This model includes a central executive system and three slave systems which are: visuospatial sketchpad, phonological loop (phonological memory, PM), and episodic buffer which is a recent addition to the model. The central executive is responsible for complex processing operations such as focusing, switching and dividing attention not attributed to the three subsidiary systems. The visuospatial sketchpad is responsible for the short-term storage and processing of visual and spatial information. The PM component of the working memory system has

two subcomponents: the phonological store which is responsible for storing verbal information for short periods of time (~2 s), and is represented in a sound-based (phonological) code. The articulatory rehearsal system refreshes the contents of the phonological store so that information can be held in PM for longer than 2 s. The episodic buffer combines information from long-term memory and the specialized subsidiary storage systems to create integrated episodes (cited in O' Brien, et al, 2006).

The body of research that claims to support the role of the phonological loop in language learning is extensive (e.g. Baddeley, Gathercole, & Pappagno, 1998; Ellis, 2001). There is abundant evidence that PM is related to children's L1 vocabulary knowledge, even as late as 14 years of age, and to their ability to learn new words (Baddeley et al., 1998). With regard to speech production, however, there have been only a few investigations into the role of PM in L1 speech. Studies examining L1 speech corpora in normally developing preschool children have found that children with better PM skills produce longer, more grammatically complex, and lexically richer utterances than children with less well-developed PM abilities (Adams & Gathercole, 1995, 2000). PM predicts the mean length of utterance better than does chronological age or mental age, and utterance length is correlated with sentence complexity such that children who produce longer utterances, and hence have better PM skills, show greater grammatical and semantic complexity (Blake, Austin, Cannon, Lisus, & Vaughan, 1994). Finally, PM predicts both the amount of story information recalled and the sentence length that children use in their narration (Adams & Gathercole, 1996). These studies suggest that PM is implicated in certain aspects of L1 speech production, namely in utterance length, and grammatical and semantic complexity (cited in O' Brien, et al, 2006).

## **1.2. Statement of the Problem**

There is abundant evidence that phonological memory (PM), a sub-component of working memory, is closely related to various aspects of second language (L2) learning in a variety of populations, suggesting that PM may be an essential cognitive mechanism underlying successful L2 acquisition (Carroll, 2008). Research done by scholars has revealed a close link between language acquisition and the capacity of the verbal component of working memory, and the phonological memory (Baddeley,

Gathercole, and Papagno, 1998). It has been claimed that phonological memory plays a crucial role learning vocabulary of both first and second language (Baddeley, 2003). The relation between phonological memory and grammar ability has also been well established (O' Brien, et al, 2006).

Considering the importance of phonological memory in language learning, this study seeks to investigate the relationship between phonological memory capacity and EFL learners vocabulary and grammar knowledge. In other words, attempts will be made to estimate participants' phonological memory and see if there is a significant correlation between their phonological memory and grammar and vocabulary knowledge. In a second place, to investigate the importance of phonological memory at different levels of language proficiency, correlation between level of participants' language proficiency and phonological memory capacity is to be estimated.

### **1.3. Purpose of the Study**

The individual factors that influence language learning have been widely researched in the past 30 years (for a recent overview see Dornyei, 2005). The variables along which language learners differ are generally sub-divided into affective, cognitive and personality-related individual differences (Gardner, 1985). With some overlaps, motivation, language learning anxiety and self-confidence are generally listed among affective factors, whereas personality-related differences comprise traits such as openness to experience, conscientiousness, extraversion, agreeableness and emotional stability (Costa and McCrae, 1992). The cognitive factors that are held to be important predictors of success in language learning are intelligence (Skehan, 1986), foreign language aptitude (Carroll and Sapon, 1959; Carroll, 1981) and working memory or short term memory capacity (Sawyer and Ranta, 2001) (cited in J.Kormos and A. Safar, 2008).

As mentioned above, short term memory is responsible for language processing (Carroll, 2008). It is responsible for immediate language production and it plays an important role in language learning. If phonological memory is closely related to vocabulary reservoir and grammar, the teacher of English can enhance the capacity of phonological memory by introducing more words and the association among them and, thus; help students improve more realistically in language skills. Finding out the role that phonological memory plays in language learning can answer



many questions in this field and help us to rear more efficient techniques in language teaching.

#### **1.4. Research Questions and Hypotheses**

This study is an attempt to answer the following questions:

1. Is there any relationship between phonological memory (PM) and the development of lexical skill in terms of accuracy in using free and bound morphemes and, participants' grammatical ability which is limited to accuracy in using complex and compound sentences?
2. Is there any correlation between level of language proficiency and phonological memory capacity?

Based on the above research questions the below null hypotheses were formed rejection of which would prove that the above hypotheses are correct:

1. There is no relationship between phonological memory (PM) and the development of lexical skill in terms of accuracy in using free and bound morphemes and, participants' grammatical ability which is limited to accuracy in using complex and compound sentences.
2. There is no correlation between level of language proficiency and phonological memory capacity.

#### **1.5. Significance of the Study**

The importance of learning and correctly using grammar and vocabulary justifies this research which intends to discover the factors that seem to have an important role in learning grammar and vocabulary. In order to clarify the need for and the significance of the present study, one can start with considering the importance of vocabulary and grammar in language. If learners manage to successfully increase their ability in using grammar and vocabulary accurately, they will have saved a lot of time and gain more success in the process of language learning.

Recent research studies have specially addressed the role of phonological memory in learning vocabulary and grammar. It has been claimed that those with better phonological memory, learn better than others. If it proves that phonological

memory is correlated with accuracy of using vocabulary and grammar, teachers can help students develop their phonological memory, so they would be able to speak more accurately.

## **1.6. Outline of the Thesis**

This thesis consists of five chapters. In the first chapter the statement of the problem, the purpose of the study as well research questions and hypotheses are presented. In the second chapter, the review of literature, previous studies and different models will be elaborated. The third chapter describes the participants, materials, procedures and data analysis. The results of the study as well as discussion and conclusion will be explained in the fourth chapter. Finally, the implications and suggestions for further research will be discussed in the fifth chapter.

## **1.7. Definition of Key Terms**

*Phonological memory:* It is a subcomponent of working memory and it is responsible for holding phonological representations for a brief period of time (Carroll, 2008)

*Free morphemes:* A free morpheme is a simple word, a word consisting of a single morpheme and necessarily one morpheme (Hudson, 2000).

*Bound morphemes:* Bound morpheme or derivational morphemes are those which cannot be used alone and must always be combined with others morphemes within a word (Hudson, 2000).

*Compound sentences:* A compound sentence is composed of at least two independent clauses. It does not require a dependent clause.

*Complex sentences:* A complex sentence is a sentence with one independent clause and at least one dependent clause.

**Chapter Two**  
**Review of Literature**

## **2.1. Psycholinguistics**

Carroll defines Psycholinguistics as "the study of how individuals comprehend, produce, and acquire language [...] psycholinguistics stresses the knowledge of language and the cognitive processes involved in ordinary language use" (Carroll, 2008, 3).

Some other scholars have provided other descriptions. To Field (2003), psycholinguistics is the exploration of the relationship between human mind and language. It treats language users as individuals rather than a part of a language society, but he still believes that all the individuals share the same apparatus to produce that language.

Field (2004) believes that the boundaries of psycholinguistics are fuzzy and there is not much agreement over what should fit in the field. A broad view of the discipline might include 1) *language processing* which is language skills of reading, writing, speaking and listening and the role of memory in language. 2) *Lexical storage and retrieval* which studies how we store words in your minds and how we find them when we need them. 3) *first Language acquisition* 4) *Special circumstances* deals with the effects upon language caused by deafness, blindness or conditions such as dyslexia or aphasia. 5) *The brain and language* is the area which studies the location of language in the brain and whether it is a unique human ability or not. 6) *Second language acquisition and use*.

As it was mentioned, one of the areas that psycholinguistics focuses on is the mechanisms of how language is stored and recalled. Studying different types of memory and their role in language learning, language production and comprehension is also in the scope of psycholinguistics. In the latter part, different types of memory, their role in language production and comprehension will be discussed.

## **2.2. Memory**

"Memory is the quintessence of human experience without which we cannot make progress, cannot learn from experience, and cannot develop a personal identity. Learning and memory are locked together: learning depends on memory, and learning is evidence of memory" (Chamberlain, 1995).

### **2.2.1. Old Theory of Memory**