

**In the Name of God**



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**Entitled:**

**Reaction time in masked and unmasked semantic priming  
with L1 vs. L2 primes**

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**Abstract:**

One of the main issues in psycholinguistics is bilingual memory. The field has long been concerned with the way bilinguals restore words in their mental lexicon, and the way they retrieve them. The more information regarding bilingual memory is obtained, the more efficient would be second language teaching methods. The present study is an attempt to investigate if bilinguals share semantic features of their L1 and L2 using masked and unmasked semantic paradigm. In masked priming, the primes were presented for a very short time and they were covered by a mask or a row of hash marks (#####). In unmasked priming, the primes were presented for a bit longer time and they were not covered any more. Target-prime pairs addressed in the study were semantically related words in four experiments. In all experiments target words were in English. But primes were in Persian in two experiments and in English in another two. Two experiments were masked and two others unmasked. All experiments were done using DMDX software for measuring reaction times. Sixty Persian-English bilinguals participated in the study. Nevertheless semantic priming effect under masked and unmasked conditions was not found in any of the experiments. It is suggested that bilinguals have shared semantic representation for two languages with different scripts only for cognate words. So using semantically related words, for non-cognate words, between languages in the process of language teaching is more recommended in higher proficiency levels.

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# **Chapter One**

## **Introduction**

## **1.0. Introduction**

Psycholinguistic research focusing on bilingual memory is considered to prepare the way for applied linguists who attempt to come up with effective teaching methods. Some questions like whether bilinguals restore the information for the two languages in one lexicon or two separate lexicons, whether while accessing a word in a specific language, codes for both languages are activated or only the one for the intended language, and so many other questions are addressed by psycholinguistic research.

As it is clear, in order for a teaching method to be practical, it should be in accordance with two important processes of how bilinguals store the data for their second language (L2) and how they access it. Therefore, the more psycholinguistics casts light on bilingual mental lexicon and mental processes, the more efficient would be the teaching methods proposed by applied linguistics.

In the present study, masked and unmasked priming paradigm is used in order to look into bilingual memory and investigate the hypothesis whether Persian and English primes can facilitate accessing English targets or not.

The chapter is a general overview of how the study was conducted. It starts with a brief overview of more general theories underlying the study as mental lexicon, lexical entries, lexical storage, lexical access, priming, and masked priming followed by the introduction of key terms, research questions, and hypotheses.

## **1.1. Mental Lexicon**

The mental lexicon is defined as a mental and biological dictionary that contains information regarding a word's meaning, pronunciation, syntactic characteristics, and so on. It is a construct used in linguistics and psycholinguistics to refer to individual speakers' lexical, or word, representations. This mental dictionary is usually compared to a common dictionary in which all information related to meaning, pronunciation etc., about the words are stored. However, the mental lexicon differs from the lexicon in that it is not just a general collection of words; instead, it deals with how those words are activated, stored, processed, and retrieved by each speaker. An individual's mental lexicon changes and grows as new words are learned and is always developing. The development of a second mental lexicon (L2) in bilingual speakers has also been a topic of interest, suggesting that a speaker's multiple languages are not stored together, but as separate entities that are actively chosen from in each linguistic situation. Mental lexicon and how words are accessed from memory in monolinguals and bilinguals have long been subject to research (e.g., French & Jacquet, 2004).

## **1.2. Bilingual Lexical Access**

Bilingual lexical access is an area in psycholinguistic research that studies the activation or retrieval process of the mental lexicon for people who can speak two languages. Bilingual lexical access can be understood as all aspects of word processing, including all the mental activities from the perception of the word from one language until all its lexical knowledge from the target language is available. Research in this

field seeks to fully understand these mental processes. Bilingual individuals have two mental lexical representations for an item or concept and are able to successfully select words from one language without significant interference from the other language (De Groot, 2011). Thus, it is important to understand whether these dual representations interact or affect one another. Bilingual lexical access researchers focus on the control mechanisms bilinguals use to suppress the language not in use when in a monolingual mode and the degree to which the related representations within the language not in use are activated. For example, when a Dutch-English bilingual is asked to name a picture of a dog in English, he or she will come up with the English word *dog*. Bilingual lexical access is the mental process that underlies this seemingly simple task: the process that makes the connection between the “idea” dog and the word dog in the target language. While activating the English word *dog*, the Dutch word *hond* (its equivalent in Dutch), is most likely also in a state of activation (Costa & La Heij, 2006).

### **1.2.1. Language-selective Access vs. Language-nonselective Access**

The two most prominent theories on lexical access for bilinguals, Language Selective Access and Language Non-Selective Access, attempt to explain the process and stages of lexical activation and selection. These hypotheses focus on determining whether lexical candidates from different languages that share similar lexical features are activated when a word is presented. For instance, when the Dutch word *vork* is activated, is the English word *pork* also activated? If the answer is “no”, it might suggest that language selection happens before the recognition of a word and only the

lexical information of the target language is selectively activated, in which case lexical access is language selective (Dijkstra, 2005). If the answer is “yes”, it might suggest the other possibility that the recognition of a word is processed in parallel for both languages and the lexical information of both languages are activated, in which case lexical access is language non-selective (Grainer & Beauvillain, 1987). Research pertaining to lexical access has indicated that it is not achievable to completely suppress a known language (Kroll & Tokowicz, 2005). It should be noted that reviews done by several researchers (e.g., de Groot, Delmaar, & Lupker, 2000) favor selective access.

### **1.2.2. Compound Bilinguals vs. Coordinate Bilinguals**

The issue is more complicated, and models suggested to account for the process are more diverse in case of bilinguals. Whether bilinguals store the words from two languages in one single lexicon (compound bilinguals), or two different lexicons (coordinate bilinguals) has been subject to dispute (Weinreich, 1953; Evrin, & Osgood, 1954). In compound bilingualism, the person learns the two languages in the same context where they are used concurrently, so that there is a fused representation of the languages in the brain. This is the case when a child is brought up by bilingual parents, or those from two different linguistic backgrounds. This is additive in nature. But in coordinate bilingualism, the person learns the languages in separate environments, and words of the two languages are kept separate with each word having its own specific meaning. This may also be referred to as subtractive bilingualism.

As for the beginning, the experiments that have led to the models so far suggested for bilingual memory is discussed followed by a brief explanation of two of the most popular models of bilingual memory.

### **1.3. Priming and Priming Studies**

Priming is an implicit memory effect in which exposure to one stimulus influences a response to another stimulus. Meyer and Schvaneveldt (1971) showed that people were faster in deciding that a string of letters is a word when the word followed an associatively or semantically related word. For example, NURSE is recognized more quickly following *DOCTOR* than following *BREAD*. Various experiments supported the theory that activation spreading among related ideas was the best explanation for the facilitation observed in the lexical decision task (Schvaneveldt & Meyer, 1973). The priming paradigm provides excellent control over the effects of individual stimuli on cognitive processing and associated behavior because the same target stimuli can be presented with different primes. Thus differences in performance as a function of differences in priming stimuli must be attributed to the effect of the prime on the processing of the target stimulus. So priming is a term used in lexical decision tasks that accounts for decreased reaction times of related words. Interchangeable with the word "activation" in many cases, priming refers to the ability to have related words assist in the reaction times of others.

Within-language priming studies (e.g., Fischler, 1977; Chen & NG, 1989; Scarborough, Gerard, & Cortese, 1984) and cross-language priming studies (e.g.,

Keatley & de Gelder 1992; Kotz, 2001; Kotz & Guttler, 2004) have been carried out with various languages. The masked and unmasked priming paradigms have been widely used in the last two decades in order to investigate both orthographic and phonological activations during visual word recognition.

#### **1.4. Masked Priming**

Masked priming has become a very popular technique in psycholinguistics and other areas of cognitive psychology. In this paradigm a stimulus (the prime) is presented for very short presentation duration and is immediately followed by the target, which causes backward masking of the prime. The combined action of masking stimuli and short presentation of the prime results in a consciously imperceptible stimulus.

The advantage of masked priming is that it allows one to investigate the effect of a particular prime-target relationship without participants' awareness of the manipulation, such that they cannot develop response strategies. Thus considered the technique is a relatively pure way to probe into the machinery of lexical processing (Forster & Davis, 1984).

Masked priming paradigm is the most frequently used method for studying subliminal processing (Merikle, 2000). The extent to which unconscious information can influence behavior has been a topic of considerable debate throughout the history of psychology. Most researchers found significant priming in their analyses, indicating that unconsciously presented information can influence behavior (e.g., Williams, 1994;



Grainger & Frenk-master, 1998; Jiang & Forster, 2001; Duyck, 2005; Perea et al., 2008; Schoonbaert and et al., 2009; Zhao and et al., 2011; Chen and et al., 2014.).

The theory underlying masked priming paradigm is subliminal psychology according to which unconsciously perceived stimuli can affect one's decisions, thoughts, etc. (Merikle, 2000). Though visual subliminal message in masked priming is presented only for a very brief period of time, it does not reach consciousness level; though we do not see it, our brain processes it. The evidence that the stimulus in masked priming affects later decisions is already confirmed by behavioral and neuropsychological evidence.

### **1.5. Statement of the Problem and Purpose of the Study**

One of the foundations of psycholinguistic research is to explore the efficient way of teaching people a second language. In this process one of the major questions that psycholinguistics tries to answer is how people represent the two languages i.e., whether they have a separate representation for each language, or a single conceptual representation shared by two languages.

Priming experiments have long been considered as a reliable evidence for separate or shared semantic representations. Masked priming, as a technique considered to reflect automatic rather than strategic processes, has been reported to be a more reliable evidence for models of bilingual shared conceptual representations (Gollan, Forster, & Frost, 1997, as cited in Javadi, 2014). It eliminates any possibility of consciously

deployed strategies, and this way it is considered to be a pure demonstration of cross-language shared conceptual representation.

The purpose of the present study would be to explore whether within-language and cross-language masked and unmasked priming effect can be achieved with Persian-English bilinguals.

### **1.6. Significance of and Justification for the Study**

Psycholinguistics should inform us about the effective way of teaching people a second language. In this process, one evidence in favor of shared conceptual representation would be a demonstration of semantic priming effect across languages. Although the findings of within-language and cross-language priming studies are rather varied, and more research with various languages is needed in order to achieve more conclusive results. Most of the research addressing cross-language semantic priming is carried out with languages that make use of the same script (e.g., English and French). However, the same experiment with languages which use different scripts (e.g., English and Persian) may yield different results signifying different underlying mechanisms. The present study not only includes within-language experiments in English, but also addresses languages with two completely different scripts (i.e., Persian and English), through masked and unmasked paradigms.

### **1.7. Research Questions and Hypotheses**

The study was conducted to answer the following questions for which two hypotheses were formulated:

**RQ1:** Can masked semantic priming effect be achieved using L2 primes for Iranian EFL learners?

**Null Hypothesis 1 (Ho1):** Masked semantic priming effect cannot be achieved using L2 primes for Iranian EFL learners.

**Alternative Hypothesis 1 (H1):** Masked semantic priming effect can be achieved using L2 primes for Iranian EFL learners.

**RQ2:** Can masked semantic priming effect be achieved using L1 primes for Iranian EFL learners?

**Null Hypothesis 2 (Ho2):** Masked semantic priming effect cannot be achieved using L1 primes for Iranian EFL learners.

**Alternative Hypothesis 2 (H2):** Masked semantic priming effect can be achieved using L1 primes for Iranian EFL learners.

**RQ3:** Can unmasked semantic priming effect be achieved using L2 primes for Iranian EFL learners?

**Null Hypothesis 3 (Ho3):** Unmasked semantic priming effect cannot be achieved using L2 primes for Iranian EFL learners.

**Alternative Hypothesis 3 (H3):** Unmasked semantic priming effect can be achieved using L2 primes for Iranian EFL learners.

**RQ4:** Can unmasked semantic priming effect be achieved using L1 primes for Iranian EFL learners?

**Null Hypothesis 4 (Ho4):** Unmasked semantic priming effect cannot be achieved using L1 primes for Iranian EFL learners.

**Alternative Hypothesis 4 (H4):** Unmasked semantic priming effect can be achieved using L1 primes for Iranian EFL learners.

## **1.8. Key Terms**

### **1.8.1. Semantic Priming**

Semantic priming occurs when a word presented earlier activates another semantically related word. Semantic priming is based on the hypothesis that when an item from semantic category is activated this activation automatically spreads the other nodes and accordingly other words in that semantic network are processed faster. It is called spreading activation hypothesis. Spreading activation is a method for searching associative networks, neural networks, or semantic networks.

In semantic priming, the prime and the target are from the same semantic category and share the same features. For example, the word dog is a semantic prime for wolf, because the two are both similar animals. Semantic priming is theorized to work because of spreading neural networks. When a person thinks of one item in a category, similar items are stimulated by the brain.

In measuring priming effects, a prime word is presented for a very brief amount of time which later disappears and a target word takes its place. For the purpose of comparing, the experiment includes primes that are related to the target as well as primes that are unrelated to the target. The hypothesis predicts faster responses to the targets preceded by a related prime than by an unrelated prime.