Hacettepe University Graduate School of Social Sciences

Department of English Linguistics

INVESTIGATING THE RELATIONSHIP BETWEEN L1 AND L2 COLLOCATIONAL PROCESSING IN THE BILINGUAL MENTAL LEXICON

Hakan CANGIR

PhD Dissertation

Ankara, 2018

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KABUL VE ONAY

Hakan CANGIR tarafından hazırlanan "Investigating the Relationship between L1 and L2 Collocational Processing in the Bilingual Mental Lexicon" başlıklı bu çalışma, 06.06.2018 tarihinde yapılan savunma sınavı sonucunda başarılı bulunarak jürimiz tarafından doktora tezi olarak kabul edilmiştir.

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ÖZET

CANGIR, Hakan. *İki dillilerin zihin sözlüğünde gerçekleşen birinci ve ikinci dildeki eşdizimli sözcük işlemleme ilişkisinin incelenmesi*, Doktora Tezi, Ankara, 2018

Birçok çalışma iki dillilerin zihin sözlüğünün nasıl şekillendiğini araştırma girişiminde bulunmuş ve her iki zihin sözlüğünün ya da tek bir zihin sözlüğünde yer alan D1 ve D2 sözcüksel birimlerinin dil üretimi sırasında etkileşime geçtiği birçok araştırmacı tarafından ortaya konulmuştur. Ancak, ilgili alanyazınında sözcüklerin zihinde etkinleştirilmeleri ve seçimleri sürecinde iki farklı dildeki zihin sözlükleri ya da tek bir zihin sözlüğünde yer alan kelimeler arasında ne gibi etkileşimler gerçekleştiği konusunda farklı görüşler bulunmaktadır. Bu görüşler, özellikle de sözcük etkinleştirilmesinin hangi evresinde zihin sözlükleri arasında bir etkileşim gerçekleştiğini sorgulamakta ve bu etkileşimi tetikleyen etmenlerin neler olduğu konularına yoğunlaşmaktadırlar. Kuramsal ve uygulamalı çalışmalar yürüten birçok dilbilimci tarafından incelenen ve alanyazınında geniş bir şekilde tartışılan bir diğer konu ise şudur: Bir sözcüğün etkinleştirilmesinde ve seçiminde işleyiş yalnızca ana dili ya da yalnızca ikinci dil bağlamında mı gerçekleşmektedir, yoksa her iki dil sistemi aynı anda mı etkinleşmekte; diğer bir deyişle, süreç bütünleşik mi işlemektedir? Bu çalışma, söz konusu işlemin bütünleşik bir biçimde gerçekleştiği görüşünden yola çıkmakta (örn. Green, 1986, 1998a, 1998b) ve iki dillilerin zihin sözlüğünde gerçekleşen diller arası etkileşime, üzerine çok fazla araştırma bulunmayan eşdizimli sözcükler bağlamında ışık tutmaya çalışmaktadır. Ayrıca, bu araştırma, iki dil arasında hangi sözcüğün önceleneceği konusuna, diğer çalışmalarda ele alınan dillerden tipolojik olarak farklı bir dil olan Türkçe açısından yaklaşmakta, İngilizce D2 olmak üzere, daha önce yapılan çalışmalardan farklı olarak konuyu yatay dizimsel açıdan ele almaktadır. Daha net olmak gerekirse, Hoey'in (2005) "Sözcüksel Önceleme Kuramında" sözünü ettiği, her sözcüğün yatay dizimsel ilişkide olduğu diğer sözcükler ile birlikte öncelendiği bakış açısını, daha önce araştırılan dillerden farklı bir dile odaklanarak güçlendiren bu araştırma (a) iki dillilerin (Türkçe D1 – İngilizce D2) zihninde Türkçe eşdizimli sözcüklerde önceleme olup olmadığını incelemekte, (b) iki dillilerin zihin sözlüğünde gerçekleşen eşdizimli sözcüklerde öncelemeye Türkçe ve İngilizce'yi karşılaştırarak ışık tutmakta ve (c) tüm bu süreçleri etkileyen değişkenleri aydınlatmaya çalışmaktadır. Bu amaçlar göz önünde bulundurularak, çalışmada kullanılacak eş dizimli sözcükler, iki temsili ve dengeli derlem vasıtasıyla, sözcük sıklıklarına, şeffaflıklarına ve iki dil arasındaki benzerliklere bakılarak seçilmiştir. Daha sonra, üç ayrı önceleme deneyi tasarlanmış, iki dilli katılımcılardan sözcük karar testine yanıt vermeleri istenmiş ve adayların reaksiyon süreleri özel bir yazılım tarafından kaydedilmiştir. Muhtemel bir önceleme etkisini saptamak için adayların sözcük karar testi sırasında eş dizimli olan ve olmayan sözcüklere verdikleri yanıtlar karşılaştırılmıştır. Buna ek olarak, her bir dilde sözcüğün sıklık görünümlerinin, iki dil arasındaki benzerliklerin ya da tiplojik farklılıkların, deneylerde sözcüklerin D1'den D2'ye veya D2'den D1'e doğru sunuluş sırasının ve dile maruz kalma şeklinin eşdizimli sözcüklerde önceleme üzerinde etkisi irdelenmiştir. İlk deneyin bulguları, eş dizimli sözcüklerde öncelemenin iki dillilerin zihin sözlüğünde Türkçe bağlamında gerçekleştiğini ve sözcük sıklıklarının bu süreçte önemli bir rol oynadığını ortaya koymuştur. İkinci deneyin bulguları göstermiştir ki, eşdizimli sözcüklerde diller arası önceleme SIFAT+İSİM sözcük grupları için geçerlidir ve bu durumun İSİM+FİİL sözcük grupları için geçerli olmaması İngilizce ve Türkçe arasındaki tipolojik farkla açıklanabilir. Ayrıca, diller arası benzerliğin, eşdizimli sözcüklerde sıklık görünümünün ve sözcüklerin sunuluş sırasının öncelemeyi kısmen etkilediği gözlemlenmiştir. Örneklem grubu en az iki yıldır İngiltere'de yaşayan kişilerden oluşan son deneyin buluguları, D2'ye maruz kalma şeklinin eş dizimli sözcüklerde işlemleme üzerinde etkisi olduğunu işaret etmektedir. Tüm bu bulgular alanyazınındaki iki dilli zihin sözlüğü modelleri ("Spreading Activation Model", Collins ve Loftus, 1975; "Dual Activation of Collocational Connections", Wolter ve Gyllstad, 2011; "Modified Hierarchical Model", Pavlenko, 2009) ve ikinci dilde sözcük edinimi modeli ("Psycholinguistic Model of Vocabulary Acquisition in L2", Jiang, 2000) ışığında tartışılmıştır.

Anahtar Sözcükler

Zihin Sözlüğü, Eşdizimlilik, Eşdizimli Sözcüklerde Önceleme, İkidillilik, Diller Arası Karşılaştırma

ABSTRACT

CANGIR, Hakan. *Investigating the relationship between L1 and L2 collocational processing in the bilingual mental lexicon*, PhD Thesis, Ankara, 2018

Many studies have attempted to investigate how the bilingual mental lexicon is structured and it has been suggested by various researchers that both lexicons or L1 and L2 lexical items in a single mental lexicon seem to interact to a certain extent during language production. However, there are certain disagreements over the interaction between these two mental lexicons or lexical items in a single lexicon during the lexical activation and selection processes. Particularly, some questions like “in which phase of the activation process can we observe an interaction?” and “what are the factors affecting this interaction?” have been raised. Another related topic scrutinized by many theoretical and applied linguists and hotly debated in the literature is whether the activation of lexis is language specific or language non-specific. The current study attempts to assume the process to be language non-specific (e.g. Green, 1986, 1998a, 1998b) and tries to illuminate the cross-linguistic nature of the bilingual mental lexicon with a specific emphasis on collocations, which seems to be an understudied topic. In addition, the research approaches the issue of cross-linguistic lexical priming from a syntagmatic perspective with the help of a typologically different language, Turkish, which previous research appears to lack. To be more precise, extending Hoey’s (2005) lexical priming theory which suggests that every word is primed to occur with particular other words it collocates by studying a typologically different language, the study attempts to explore (a) the existence of collocational priming in Turkish in the bilingual mental lexicon, shed light on (b) the cross-linguistic aspect of collocational priming in L1 Turkish and L2 English bilinguals, and (c) illuminate the possible factors affecting (cross-linguistic) collocational priming in the bilingual mental lexicon. To this end, sixty collocational items were extracted from two balanced corpora based on their frequency values, semantic transparency and congruence. Next, three priming experiments were designed and the L1 Turkish-L2 English bilingual participants were asked to respond to a lexical decision task with the help of a software designed for reaction time experiments. The mean reaction times for collocate and noncollocate items were compared to investigate a potential priming effect. In addition, the influence of collocational frequency, congruence, typology, presentation direction (L1-L2 or L2-L1), and type of exposure on (cross-linguistic) collocation priming was scrutinized. The findings of the first experiment revealed that collocational priming existed in Turkish in the bilingual mental lexicon and collocational frequency played a significant role in collocational processing. The results of the second experiment indicated that there was cross-linguistic collocational priming for ADJ(ective)+N(oun) word combinations only suggesting a typology effect and that congruence, collocational frequency and presentation direction (L2-L1 or L1-L2) were playing partial roles in the process. Last but not least, the results of the third experiment whose participants had been living in the UK for at least two years showed that the type of exposure to L2 appeared to influence how collocations were processed cross-linguistically. The output from the experiments were discussed in the light of the current bilingual mental lexicon models and second language vocabulary acquisition frameworks; Spreading Activation Model (Collins and Loftus, 1975), Dual Activation of Collocational Connections (Wolter and Gyllstad, 2011), Modified Hierarchical Model (Pavlenko, 2009) and Psycholinguistic Model of Vocabulary Acquisition in L2 (Jiang, 2000).

Key Words

Mental Lexicon, Collocation, Collocational Priming, Bilingualism, Cross-linguistic Comparison

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

Abbreviation	**Explanation**
ADJ	Adjective
AU SFL	Ankara University School of Foreign Languages
BNC	British National Corpus
CEFR	Common European Framework for Reference for Languages
COCA	Contemporary Corpus of American English
EFL	English as a Foreign Language
ERP	Event Related Brain Potentials
ESL	English as a Second Language
IELTS	International English Language Testing System
KPDS	Kamu Personeli Dil Sınavı (English Language Test for State Officers)
LDT	Lexical Decision Task
LHQ	Language History Questionnaire
MI	Mutual Information
N	Noun
POS	Part of Speech
RT	Reaction Time / Response Time
SOA	Stimulus Onset Asyncrony
TOEFL	Test of English as a Foreign Language
TNC	Turkish National Corpus
V	Verb
YDS	Yabancı Dil Sınavı (Foreign Language Test)

GLOSSARY OF KEY TERMINOLOGY

Bilingualism: Although there are many different dimensions of bilingualism in the literature, according to Fromkin et al. (2013) bilingualism stands for the ability to speak two languages, either by an individual speaker, which is referred as ‘individual bilingualism’, or within a specific society, considered as ‘societal bilingualism’.

Collocation: There are two broadly-accepted approaches to the definition of collocations; frequency based (corpus-driven collocational frequency values are important) and phraseological (transparency of the word combinations is important). The current research merges the two approach and exploits semi-transparent word combinations since they are seen as collocations by the phraseological approach with a frequency score of at least 2.0 *t*-score and 3.0 MI value (Schmitt, 2010).

Code-switching: It is “a speech style unique to bilinguals, in which fluent speakers switch languages between or within sentences”. It is also regarded as “a universal language-contact phenomenon reflecting the grammars of both languages are working simultaneously”; that is, both languages of a bilingual are activated at the same time (Fromkin et al, 2013: p.310).

Congruence: As far as collocations are concerned, congruence relates to equivalence of word combinations in terms of their meaning in L1 and L2. If collocations in L1 and L2 have the same meaning, they are regarded as congruent collocations (e.g. cold war – soğuk savaş) (Nesselhauf, 2014).

Corpus: Corpora are large and representative samples of a particular type of language (i.e. genre), so they can therefore be used as a standard reference with which claims about language can be measured (Baker, 2006).

Delta p (ΔP): It is a statistically computed frequency value indicating the bi-directional collocational strength of a word combination (Gries, 2013).

Dexterity: It stands for the dominant hand (i.e. Right-Dominant, Left-Dominant or both). Participants’ dominant hand could yield important information for researchers conducting priming experiments (Jiang, 2012).

DMDX: It is a software designed for psycholinguistic research investigating response times. It was developed at Monash University and at the University of Arizona by K. I. Forster and J. C. Forster and provided as an open-source tool (Forster and Forster, 2003).

Formulaic Language: Recurrent multi-word lexical items or expressions that have a single meaning or function and are pervasive in language use (Schmitt, 2010).

Lexical Decision Task: It is a computerised word/non-word discrimination task with accuracy of response and reaction time (RT) in milliseconds to be used as the dependent variable in the analysis (Jiang, 2012).

Mental (Internal) Lexicon: It is regarded as "the collective representation of words in the mind, drawing together contextual, personal and interpersonal aspects of meaning, and helping essentially in the acquisition, retention and expression of language" (Roux, 2013: p.82).

Mutual Information (MI) value: MI-score employs a logarithmic scale to show the ratio between the frequency of the collocation and the frequency of random co-occurrence of the two words in the combination, which eventually indicates the collocational strength of a lexical combination (Gablasova et al., 2017).

Priming: Priming may describe all the situtations in which prior language exposure affects subsequent language processing. However, in this research, priming stands for a situation in which the processing of one lexical item (i.e. node) in a word combination triggers the co-occuring lexical item (i.e. collocate) (Hoey, 2005).

Priming Symmettry and Asymettry: Priming effect observed in L2-L1 direction is called priming symmetry as opposed to L1-L2 direction, which is called priming asymmetry (Jiang, 2015).

Relatedness Proportion: It is the ratio of accompanying prime-target lexical units out of all the lexical units in a priming experiment (de Groot, 1984).

Stimulus Onset Asyncrony (SOA): It is the interval between the onset of one stimulus (i.e. prime) and the onset of another (i.e. target) within the same trial (Jiang, 2012).

Non-word Ratio: It stands for the proportion of non-words to all the collocational items, non-collocational items, and fillers exploited in the study (Altarriba and Basnight-Brown, 2007).

Transparency: According to phraseological perspective to collocations, if both the members of a word combination bear its literal meaning (i.e. if they are fully transparent), they are treated as 'free combinations'. However, if one of the lexical items (e.g. node) have an idiomatic meaning, whereas the other one (e.g. collocate) holds its literal meaning (i.e. if the combinations are semi-transparent), they are treated as 'collocation' (Nesselhauf, 2004).

***T*-score:** It blends frequency and significance and gives the collocational strength of co-occuring lexical items by taking into account the observed and expected frequencies of the collocational items as well as the size of the corpus (Durrant and Doherty, 2010).

CHAPTER 1
INTRODUCTION

1.1. INTRODUCING THE STUDY

Extending Hoey's (2005) work on lexical priming by investigating a typologically different language and approaching the issue from a cross-linguistic perspective, the current research study mainly aims to investigate a) collocational priming in Turkish in the bilingual (L1 Turkish-L2 English) mental lexicon, b) both symmetric and asymmetric cross-linguistic collocational priming in the bilingual mental lexicon and c) the possible indicators of this process (e.g. frequency[1], congruence, part of speech, and word order[2]). In addition, the writer attempts to discuss the structure of the bilingual mental lexicon in the light of the findings of the priming experiments and offer a humble bilingual mental lexicon framework indicating the collocational links in the lexicon. Last but not least, by experimenting in two different language learning and exposure settings (i.e. UK and Turkey), the study aims to detect the possible difference in the cross-linguistic processing of collocations by L1 Turkish and L2 English language users in the UK and Turkey, who are both considered bilinguals in the current research. Attempting to fill a niche in the context of cross-linguistic collocational processing, the current study approaches the issue from the eyes of a typologically different language, Turkish.

To this end, three separate collocational priming experiments were designed. The first experiment tries to explore the existence of collocational priming in the bilingual mental lexicon using Turkish only lexical items as well as investigating the possible effect of frequency and part of speech (POS) on the process. The second experiment, which investigates cross-linguistic collocational priming, seeks to find proof for cross-linguistic collocational links in the bilingual mental lexicon and also questions certain factors, such as congruence, POS, frequency

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[1] Both collocational and (log-transformed) single word frequency (of the target words) were taken into account in the analyses.
[2] V(erb)+Noun vs. ADJ(ective)+N(oun) in English / N(oun)+V(erb) vs. ADJ(ective)+N(oun) in Turkish.

etc. affecting the possible interaction. The third experiment approaches the issue of cross-linguistic collocational processing from a language exposure angle and explores if there is a relationship between language exposure or frequency of language use and cross-linguistic collocational priming.

One of the key concepts in this research that will be addressed throughout the text is 'collocation'[3], which is defined as frequently co-occurring two word combinations with a frequency value of at least MI=3.0 and *t*-score=2.0 based on the recommendations by (Schmitt, 2010), which are also semi-transparent and thus it can be stated that frequency based and phraseological approaches are merged due to methodological purposes and theoretical concerns in the current research. Another core concept is bilingualism[4], whose definition seems to differ in the literature. The current research embraces the broader definition of bilingualism (i.e. individual bilingualism) indicating individuals who are fluent in one language and can produce meaningful utterances in the other language (Haugen, 1953). That is to say, bilinguals in this study are L1 Turkish and L2 English users, who are categorized as late or unbalanced bilinguals.

In that respect, the study has five main chapters; (a) introduction including background of the study, purpose and significance of the study, research questions, and limitations, (b) literature review, (c) methodology including the rationale for the experiments, exploited tools and participant details, (d) findings including the results of the three priming experiments as well as initial discussions and (e) general discussion including the overall interpretations, proposed mental lexicon frameworks emphasizing collocational links, pedagogical implications and suggestions for further research, respectively. The introduction chapter deals with the background of the study, purpose and the significance of the study sections emphasizing the need to conduct the current research, its importance for the literature and how it addresses the niche in the current literature. Then, the research questions are provided. The comprehensive literature review chapter starts with a discussion of the

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[3] See section 2.6.1. for a more detailed discussion of 'collocation'.
[4] See section 2.2. for a more detailed discussion of 'bilingualism'.

terminology ‘bilingualism’ and then goes on to discuss ‘mental lexicon’. Following that, the bilingual mental lexicon and the models of bilingual mental lexicon are addressed. Having set the baseline for the main discussion by explaining the fundamental concepts to be exploited throughout the study, the current research touches upon the key terminology; ‘formulaic language’ and ‘Collocations’ before scrutinizing the major paradigms ‘lexical and collocational priming’. Third chapter, Methodology, gives an overall explanation of the exploited methodology underlining the experimental methods, participants, instruments, and lexical item development procedures for all the experiments conducted. As for the fourth chapter including the results of the three experiments, numerical values of the basic questionnaires and outputs of statistical analyses are presented and expounded upon. General Discussion chapter follows the results section to provide further comments in order to elucidate what the numbers may indicate. Both the findings and discussion sections are organized based on the order of the research questions and assumptions. In the last chapter, the writer’s suggestions for further research, implications and some overall discussions are provided.

1.2. BACKGROUND OF THE STUDY

The notion of lexical priming, which is claimed to be the basis of our creative language system and can act as a unique window into the cognitive processes in the bilingual mental lexicon (Hoey, 2005), has been investigated in several studies with psycholinguistic and cognitive linguistic orientations. The psychological reality of priming, and particularly collocational priming in this study, has the potential to shed light on the organization of the bilingual mental lexicon. Furthermore, the possible existence of cross-linguistic collocational priming, which makes this particular study different from others and has intrigued the researcher in the first place, is likely to boost the language non-selective lexical access paradigms and support the idea of collocational spreading activation in the bilingual mental lexicon considering a typologically different language. Therefore, it can be stated that the potential of cross-linguistic collocational priming in reflecting cognitive processes in the bilingual mental lexicon and supporting the spreading activation framework from a collocational perspective and lack of research on collocational priming in Turkish paved the way for the current research idea.

Before discussing collocational priming, which is what the rationale of this study is primarily built on, it would be meaningful to clear the grounds by providing the different approaches to the key terminologies mentioned throughout the text, hotly debated issues in the mental lexicon literature, and the current trends within the bilingual lexical processing domain. For one thing, the concept of bilingualism, which is a key term for the current research, has been addressed by many linguists and the definition of the term has caused certain disagreements. Some had a stricter approach to the definition of bilingualism stating that in order for someone to be considered a bilingual, s/he needs to use both the languages as their native tongue at the same proficiency level (e.g. Bloomfield, 1933). However, some others approached the issue from a broader perspective saying that bilinguals are those who can use one language as their native and the other at a certain proficiency level, not necessarily native like (e.g. Weinreich, 1953). The former definition causes some difficulties in terms of the determination of certain language users as bilinguals. In addition, the borderline for a proficient language user (or a native speaker) and a less proficient language user seems to be vague since the proficiency measures are regarded as rather subjective in that sense. The latter definition, on the other hand, helps researchers in their investigations since they can be more flexible in their participant recruitment and the results of these studies can provide a better understanding of the bilingual brain with different proficiency levels. In a more recent attempt, Grosjean and Li (2013) define bilinguals as those who use two languages (one as L1 and the other as L2) in their daily lives for various purposes. They also add that the social environment where the two languages of a bilingual function is critical in terms of the structuring of the mental lexicon. Bilingualism have been classified based on various dimensions[5] and according

[5] See a more comprehensive discussion regarding the types of bilingualism in Section 2.2.

to one of those well-acknowledged dimensions, which is also closely related to the sampling group of the current research, bilingualism can be classified based on the ability to speak two languages, either by an individual speaker, which is referred as ‘individual bilingualism’, or within a specific society, considered as ‘societal bilingualism’ (Fromkin et al., 2013). The current study embraces ‘individual bilingualism’ in its investigation and has recruited its participants accordingly. On the whole, it can be said that the current research adopts a broader view of bilingualism having participants with L1 Turkish and L2 English in two different settings (i.e. UK and TR) with distinct language exposure experiences, which are assumed to impact their mental lexicon structuring.

With regard to another key concept, mental lexicon, in the study, several attemtps have been made to define the term and much research has been conducted to help illustrate the internal mechanisms of lexical processing. According to one of the more recent definitions of the term, lexicon is defined as “the collective representation of words in the mind, drawing together contextual, personal and interpersonal aspects of meaning, and helping essentially in the acquisition, retention and expression of language” (Roux, 2013: p.82). The issue of how bilingual mental lexicon is shaped has intrigued linguists and psychologists for a long time. There have been many attempts to model the internal structure of the mental lexicon and all of those attempts have approached the notion of bilingual mental dictionary from different angles helping to accumulate knowledge regarding several aspects of the phenomenon. Lexical processing includes important phases like lexical recognition, lexical activation, lexical selection, interaction between lexical nodes and so forth. There have been two well-established contradictory approaches regarding the lexical activation and selection phases in terms of the interaction of the two languages of a bilingual. The language specific lexical selection approach posits that the two languages of a bilingual do not compete for selection during lexical processing (e.g. Costa et al., 1999). Simply speaking, a bilingual activates the dominant language of use and deactivates the language which is not in the use at the moment of language production; that is why, a lexical node in the language which is in use do not trigger another related lexical node in the bilingual’s other language. On the other hand, language non-specific lexical activation approach asserts that regardless of the language in use, lexical nodes in both languages of a bilingual are activated and compete for selection (e.g. Hermans et al., 1998). In other words, even if a bilingual uses a certain language (either L1 or L2) in an L1 or L2 dominant context, the passive language runs in the background and affects the processing.

Another major argument is about the discussion of shared or separate mental lexicons at the conceptual level. There are bilingual lexicon models addressing this difference and taking into account the shared and separate conceptual domains in their depictions. One of those models, which was also employed in the interpretations of the current research findings, ‘Modified Hierarchical Model’ built on Kroll and Stewart’s (1994) ‘Revised Hierarchical Model’ by Pavlenko (2009), addresses the cross-linguistic influence of L1 and L2 as well as showing shared and distinct conceptual layers in its illustration. What these models scrutinizing lexical activation and selection processes have in common is the fact that they focus on paradigmatic relations between words. The role formulaic language on the whole and collocations in particular play in this process has not been thoroughly investigated and the current study focusing on collocational priming aims to contribute to the literature in that respect. Another framework indicating the lexical networks at single word level in the mental lexicon titled ‘Spreading Activation Model’ by Collins and Loftus (1975) has been exploited in this study to discuss the cross-linguistic collocational networks in the bilingual mental lexicon. Wolter and Gyllstad’s (2011) ‘Dual Activation of Collocational Connections’ model, which is exploited in the discussion section of this study, also has its roots in the spreading activation model and asserts that congruent collocations are activated non-selectively in two languages and the activation of one facilitates the other.

It is a widely accepted fact that formulaic language is ubiquitous in language production and it has very important purposes in communication (Schmitt, 2010). There is empirical evidence that formulaic language provides processing advantage over creatively generated language. Native speakers and advanced non-native speakers seem to store and retrieve them as chunks, which helps them in their fluency. It is further evidenced by corpus data that formulaic language (including collocations as an umbrella term) occurs very frequently both in spoken and written language and that it is a crucial component of language processing in general (Schmitt, 2010). Some linguists claim that collocation is a totally textual phenomenon and it does not reflect how language is represented in the mind (e.g. Bley-Vroman, 2002). However, considering the processing advantages it offers and its facilitative role during spontaneous speech, it would be illogical to think that it has no psycholinguistic reality or is not represented in the mental lexicon. Another important issue to consider is the use of formulaic language by L2 users and the role of formulaic language (and collocations more specifically) use in their bilingual mental lexicon organization. Research studies do not agree on the way native and non-native language users process formulaic language and collocations and it is still questioned if or to what extent L1 and L2 interact during lexical processing (e.g. Wray, 2002; Durrant and Schmitt, 2009). Priming studies with a cross-linguistic approach seek to investigate this possible interaction and attempt to explain what it means for the internal processes of the mental lexicon, though not from a collocational perspective so far (e.g. de Groot and Nas, 1991; Altarriba, 1992; Kim and Davis, 2003). More cross-linguistic studies are needed to explore the interaction of L1 and L2 at the collocational level and how this prospective relationship can add to our understanding of bilingual mental lexicon.

Embracing the psycholinguistic reality of collocations and accepting their influence on the structuring of internal lexicon, Hoey (2005) puts forward a new idea of collocational priming stating that every word is primed to occur with particular other words and that priming sets the base for our creative language system. His theory has its roots in cognitive linguistics and usage-based view of language (Bybee, 1998). Furthermore, he thinks that from a language development perspective, priming is the consequence of a language user encountering evidence regarding language use and generalising from it. As opposed to the Chomskyan view of language (1956), Hoey believes grammar emerges from lexical priming and it is the driving force behind language use and language structure. In that respect, it can be claimed that it has an important influence on the way the mental lexicon is organized both for monolinguals and bilinguals. Research studies have attempted to test Hoey's claims as they relate to English (e.g. Durrant and Doherty, 2010). However, research investigating the psychological reality of collocations at the cross-linguistic level is lacking. There has been research exploring cross-linguistic lexical priming, but their focus was on semantic association, translation equivalents, and cognates etc., which were emphasizing paradigmatic relations between lexical items rather than syntagmatic ones.

1.3. PURPOSE AND SIGNIFICANCE OF THE STUDY

Based on the findings of the related literature, it can be stated that there are still many unanswered or partially answered questions, some of which result from the different trends in methodological issues and some limitations. What is more important is that current suggestions ought to be further tested and extended to get more reliable and significant empirical evidence. The results of the current and other future research are likely to uncover some unknown details about lexical access in bilinguals. Considering the contradictory results, different methodological approaches, and certain limitations, a lot has to be tested about lexical processing before a solid baseline can be built. The current study holding a language non-selective lexical activation perspective with its preliminary assumptions attempts to shed light on one important side of these arguments through the investigation of collocational priming. To be more precise, the current study seeks to expound upon collocational priming with a cross-linguistic emphasis, which previous research lacks, and also tries to explore the existence of (cross-linguistic) collocational priming for L1 Turkish – L2 English bilinguals as well as its role in the structuring of bilingual mental lexicon.

As is discussed in Section 1.2., lexical processing involves various phases, such as lexical recognition, representation, activation, and selection. Among these, the current research mainly focuses on lexical activation and selection and attempts to investigate how or if the bilingual mental lexicons interact, whether the two dictionaries are language selective, and speculates how the possible interaction may influence the organization of the bilingual mental lexicon, on the whole. More specifically, the possible interaction of collocational items in the bilingual mental lexicon with differing frequency values is scrutinized to explore a potential priming effect. Although there are many uncertainties about how the L1 and L2 collocations interact in the mental lexicon, some research has emphasized some tendencies. For one thing, it is commonly accepted by many researchers that more frequent L2 collocations tend to be processed more quickly than less frequent L2 collocations (Wolter and Gyllstad, 2011). Besides frequency, another factor that seems to have an influence on processing is congruence (Wolter and Yamashita, 2017). Congruent collocations in L1 and L2 are those, which have word for word translations and they are claimed to be processed faster. The current research also integrates these significant variables into its investigation to explore the possible relationship between them and the priming effect as well as some other potential indicators, which are POS and the priming direction (i.e. priming symmetry vs. asymmetry).

What seems clear from the reading of the literature is the fact that the existence of collocational priming has been empirically tested for native English speakers (e.g. Hoey, 2005; Durrant and Doherty, 2010). In addition, it has been put forward by many studies (see Jiang, 2015 for a review) that cross-linguistic lexical priming tends to exist particularly for cognates, concrete concepts and translation equivalents. However, almost no research study, to the writer’s knowledge, has explored (a) the existence of collocational priming in Turkish in

L1 Turkish-L2 English bilingual mental lexicon, (b) the relationship between or the interaction of collocations in L1 and L2 lexical processing in the bilingual mental lexicon, and (c) the factors affecting the collocational priming in Turkish and the cross-linguistic collocational priming in the bilingual mental lexicon, if any. The way L1 and L2 collocations interact in the mental lexicon cross-linguistically could shed light on our understanding of lexical processing of bilinguals from a different perspective and can provide good insights into cross-linguistic lexical processing and collocational priming research. Another issue to note is the fact that no research study to the writer's knowledge has looked into the subject of collocational priming from the eyes of a typologically different language, Turkish, which would be a valuable contribution to the literature if a processing effect of typology[6] could be observed. Furthermore, because some studies (e.g. Jiang and Foster, 2001) claim that there is a cross-linguistic asymmetry in lexical priming, the researcher designed the priming experiment in a way that prime words were presented in both sides (L1-L2 and L2-L1), which could also validate or refute what has been asserted previously. In addition to that, the current study makes an attempt to compare the effects of language exposure or frequency of language use on the processing of collocations cross-linguistically, which seems to take into account the impact of exposure as an understudied variable within the context of cross-linguistic lexical priming. As a result, the findings could support the language non-selective paradigm, consolidate and extend Hoey's (2005) claims regarding the psychological reality of collocations, support the spreading activation model from a collocational perspective, offer a new mental lexicon network emphasizing collocational links in the mental lexicon, which previous models lack and enlighten linguists focusing on cognitive processes in the bilingual mind as well as applied linguists and ELT specialists with regard to variety of language related areas.

[6] The term 'typology' will be used to refer to merely the syntactic-order based varieties of English and Turkish (i.e. V+N vs. N+V collocations) throughout the text.

1.4. RESEARCH QUESTIONS

Based on the scope and goals of the current research and considering the niche in the related literature provided in Section 1.3., the research questions to be addressed throughout the study are as follows:

1. To what extent does collocational priming, if any, exist in Turkish?

2. Does item frequency[7] play a role in collocational priming in Turkish?

3. Is it possible to state that symmetric and asymmetric cross-linguistic collocational priming exists in the bilingual mental lexicon?

4. Do the syntactic-order based differences of English and Turkish influence bidirectional collocational priming?

5. To what extent does (a) collocational frequency (b) the relationship between congruent vs. non-congruent L1 and L2 collocations, if any, play a role in the bidirectional activation of L1 and L2 collocations?

6. Is there a relationship between the type of L2 exposure and collocational priming?

[7] Both collocational and log-transformed target word frequency were employed to control for skewing based on the remarks of Wolter and Yamashita (2017).

1.5. LIMITATIONS OF THE STUDY

Due to practicality concerns, sampling of this study consisted of 28 L1 Turkish-L2 English bilinguals in the first experiment, 30 bilinguals who have learnt and use English as a foreign language in Turkey in the second experiment. In addition, 13 bilinguals who learned English in Turkey but have been using English as a second language for more than two years and postgraduate students at Exeter University took part in the third experiment. The small sampling size (*N*=13) of the third experiment, which was conducted in the UK setting, can particularly be seen as a limitation and render the experiment underpowered. The sampling size could not be extended due to the number of postgraduate students the writer was able to reach and the the fact that most of the postgraduate students who the writer contacted were busy writing their dissertations and did not want go through the experimental steps which would take around two hours. Future research may have a more balanced number of participants having different exposure times in L2. In brief, although it was evident that a larger sampling size could yield more generalizable results, the number of the subjects was limited to the numbers given above considering the challenges of the experimental process.

Another limitation can be regarded as the number of lexical items used in the experiment. The researcher has worked on a list of 20000 most frequent collocations provided by COCA[8]; however, since it is almost impossible to go through all the items within a limited time, only the most frequent 3000 were explored for the current research purposes. In a more comprehensive study, all the items in the frequency list can be considered while deciding on the items to be employed in the priming study. In addition, because the collocational items (N=60) were classified as congruent-incongruent, according to POS, and either in L1-L2 or L2-L1 direction, the differences between the mean response times of certain collocate and non-collocate items did not reveal significant results although there were observable patterns between the two durations. It could have been better to have more lexical items in each category, but considering

[8] Corpus of Contemporary American English

the time participants spend during the priming experiments, which include non-word items and fillers, and all the other time-consuming experimental steps, the researcher had to limit the number of the lexical items. Furthermore, two important variables, which have been ignored in this study, proficiency level of the participants and transparency level of the collocations and their impact on the processing of collocations cross-linguistically, need attention. They could be significant indicators of response time, have the potential to affect priming, and ought to be scrutinized in future research.

Moreover, the priming method employed in this study is criticized by some psycholinguists due to the fact it fails to reflect natural language processing. The researcher in his following studies can also attempt to make use of neurolinguistics and different online psycholinguistic methods in order to test these concerns. The proposed frameworks based on the results of the priming experiment can be validated by means of other cognitive methodologies, such as eye-tracking and neuroimaging. Until more evidence through different empirical means is provided, the notion of cross-linguistic collocational spreading activation ought to be treated tentatively (see Mackey and Gass, 2005 for alternative approaches to response time research).

Another potential limitation of this study could be regarded as the lack of lemmatization. The consideration of all the lexemes of a verb or a noun in Turkish might provide a more comprehensive analysis. To give an example, the agglutinative nature of Turkish is likely to play an important role in increasing the association between the node and collocates and that’s why collocations like ‘dünya savaşı (world war)’ has the potential to reach a higher association score than its equivalent in English since the word ‘savaş-ı’ with a case marking is a stronger indicator of the word ‘dünya’ than the word ‘war’ for the word ‘world’. This may have certain implications for the cross-linguistic experiment. It should also be noted that the researcher had some sound reasons to exclude lemmatization in his investigation. First of all, the TNC[9] lacks a lemmatized

[9] Turkish National Corpus

search option and considering the time limits of this research, the researcher has decided to exclude that option. The decision can also be attributed to Durrant's findings (2014), which is discussed further in the methodology section. Future research can integrate lemmatization into its investigation and explore the issue from the lenses of an agglutinative language.

Last but not least, the fact that language history questionnaire (LHQ) and vocabulary size test were not employed for the participants in the first experiment can be regarded as a limitation of the current research. It was assumed by the educational background of the participants and with the help of the mean reaction time differences, which did not reveal any statistical significance, between the two participant groups (13 Instructors of English and 15 tertiary level students who passed their English proficiency tests) in the first experiment that they can be in the same sampling group who took the priming experiment with Turkish only collocational items aiming to explore the existence of collocational priming in Turkish and set a baseline for the second and third experiments.

CHAPTER 2
LITERATURE REVIEW

2.1. INTRODUCTION

Approaching the issue from a broader perspective, one could define bilingualism as the ability to speak two languages, though the concept requires a more profound explanation. The population of bilinguals and multilinguals constitutes a large proportion of the world and has been increasing rapidly due to the bilingual/multilingual nature of some cultures or countries and advancements in technology and education, helping people travel more and learn new languages. On the whole, the issue of how bilingualism influences cognitive processing has been of great interest to linguists and psychologists, in particular. At the micro level, the internal structure of the bilingual mental lexicon has been questioned and explored in many research studies with a psycholinguistics and cognitive perspective. Some of the hotly debated topics centres on the influence of L1 on L2 language processing, whether bilinguals have two separate mental lexicons or if they are merged, whether vocabulary processing is language specific or language non-specific in the bilingual mental lexicon and so on.

Considering the core terminology and the controversial issues in the literature, the second chapter of the dissertation will mainly provide an introduction to the topic of bilingualism and lexical processing and focus on the discussion of the key terminology in collocational processing as well as the findings of the related research. First, the section will address the key issues, bilingualism, mental lexicon, bilingual mental lexicon, formulaic language, collocations, lexical priming and cross-linguistic lexical priming as the main headings, respectively. In addition, the research studies exploring collocational processing in particular will be surveyed and scrutinized.

2.2. BILINGUALISM

It could be claimed that there is virtually nobody in the world who does not know at least a word in a language other than his/her native tongue. Therefore, a huge number of people seem to have the potential to be considered as bilinguals to a certain extent. The globalized world and its requirements encourage people to acquire or learn more than one language. As bi-/multi-lingualism has become a prevalent concept, there is a growing body of research interest with a focus on bilingualism or multilingualism. Linguists differ in their approach to the definition of bilingualism.

Bilinguals are roughly defined as people having the knowledge and use of more than one language and use both of them as their native (or near native) languages. However, many researchers (e.g. Weinreich, 1953) feel that bilingualism is not very easy to define and should be regarded as a complicated psychological and socio-cultural linguistic behaviour and it is commonly believed that bilingualism is a multi-dimensional concept (de Groot, 2011). According to Weinreich (1953), one can think of three kinds of bilingualism depending on how the two languages are acquired or the way words are organized in the bilingual mental lexicon. In ‘compound bilingualism’, the lexical nodes in both the languages are linked to a single concept in the internal lexicon, which can be achieved through balanced exposure to both the languages starting from childhood. In ‘co-ordinate bilingualism’, on the other hand, the second language is not connected to the same conceptual structure as the first language though there exists considerable overlaps between the two. In other words, each lexical item maps onto a separate meaning representation in the lexicon. The other layer of the classification, ‘subordinate bilingualism’, is used to refer to a situation where the second language develops sometime after the first language and tends to interrupt the processing of the first language. Meaning representation is achieved through the dominant language, i.e. meaning of L2 words is created via their L1 counterparts (Harley, 2005).

Bilinguals can also be classified based on age of acquisition. ‘Early bilinguals’ are those who acquire both of their languages in childhood, an example of which can be seen in countries like Canada where two languages are spoken at home and taught at school at the same time. They are divided into two subcategories as ‘early simultaneous bilinguals’, who are exposed to both the languages from birth and ‘early consecutive or sequential bilinguals’, who have one of their languages as native and the other as L2 but from an earlier period in childhood. This situation can be observed in families in which partners have different first language backgrounds and their babies may acquire the language of the country they live in first and then his/her father’s or mother’s native language as a second language. ‘Late or achieved bilinguals’, on the other hand, are also divided into two categories as ‘adolescent bilinguals’, which refers to a duration regarded as a critical boundary in language learning ability and ‘adult bilinguals’, who learn their second language later in their lives for various purposes. Bilinguals can further be classified depending on their relative competence in each language. ‘Balanced or symmetrical bilinguals’ are those who are seen as native in both languages. On the other hand, ‘dominant or unbalanced bilinguals’ refer to those who use one language as their native tongue and the other one as a foreign or second language at various proficiency levels. Another dimension is the social status of each language. In ‘additive bilingualism’, bilinguals are in an environment in which both of their languages are socially valued and “the two languages combine in a complementary and enriching fashion” (Wei, 2007: p.6). In ‘subtractive bilingualism’, one of the languages, which is mainly L1, is divalued and there tends to be a social pressure not to use it. Wei (2007) states a subtractive bilingual is someone who acquires his/her second language at the expense of losing the skills and abilities acquired in the native language.

Looking at the issue from a slightly different angle, Fromkin et al. (2013) state that the term bilingualism stands for the ability to speak two languages, either by an individual speaker, which is referred as ‘individual bilingualism’, or within a specific society, considered as ‘societal bilingualism’. They add that individual bilingualism can be observed at various levels. That is, some may use both languages as their native tongue, whereas some others, who are native speakers of one language may exploit the other language as an advanced or intermediate level user, but lack native language user control of the linguistic feautures of that language. What is more, some bilinguals may be better at oral skills, while some others may be skilled at written language abilities. Societal bilingualism exists in nations where people learn official and national languages simultaneously (e.g. Switzerland).

There are continuing disputes among researchers, theoreticians and linguists considering the borders of bilingualism and what is truly meant by the word ‘bilingual’. The questions frequently asked by the experts are; if one wants to be considered a bilingual, to what extent does s/he have to have a command of the languages in question? What does having a good command of two languages mean? What level of proficiency can be accepted as a native-like competence? As is commonly accepted by some, bilinguals appear to be considered as individuals having “native-like command of two languages” (Bloomfield, 1933, p. 56), also referred as ‘balanced bilingualism’. This narrow and firm view of bilingualism; however, seem to restrict the categorization of people as bilinguals. Furthermore, if it is defined in such a restricted way as depicted above, it becomes even more challenging to operationalize ‘native-like fluencies’. As opposed to the narrow and strict view of bilingualism, Haugen (1953, p. 7) delineated bilinguals as “individuals who are fluent in one language but who can produce complete meaningful utterances in the other language” although s/he doesn’t have a native-like fluency. This definition makes it possible to classify even early-stage L2 learners as bilinguals to a certain extent. Many researchers have adopted this broader view of bilinguals and those researchers went on to define bilinguals as individuals having various degrees of proficiency in both languages. (Hakuta, 1986; McNamara, 1967; Mohanty and Perregaux, 1997; Valdés and Figueroa, 1994). According to Li (2006), bilingualism is a product of extensive language contact, which shows that in order for a person to be seen as a bilingual, s/he needs to have extensive contact with both languages, the borders of which is hard to define and thus the definition is limited in that respect. Another critical concern raised by Baker and Prys Jones (1998) is the inadequacy of the assessment methods employed to test language skills; reading, listening, speaking and writing in an attempt to decide if a person is bilingual or not. They further state that proficiency measure may not be the best approach to detect bilingualism.

The current study has embraced the broader definition of bilingualism and approaches the issue from the perspective of ‘individual bilingualism’. Therefore, the subjects of the second and third experiments consist of late (i.e. unbalanced) bilinguals; that is to say, people with native proficiency in Turkish and advanced in English, who can also be seen as productive or secondary bilinguals (Wei, 2007). Because the participants of Experiment 2 and 3 are assumed to have different language exposure experiences, which is expected to influence the way words are organized in their lexicon, they may tentatively be grouped as either compound or coordinative bilinguals. The participants of the first experiment, on the other hand, consist of late bilinguals who are L1 Turkish and L2 English users at different levels (no lower than intermediate) since the core investigation was collocational priming in Turkish. Embracing a broader view and definition of bilingualism seems to be advantageous on the grounds that this approach takes the developmental processes of second language acquisition into account while conducting studies on bilingualism (Hakuta, 1986). Although the developmental process of second language acquisition would be an important variable for the current study, the researcher decided not to take different proficiency levels into account due to time constraints.

Research on bilingualism has the potential to provide useful insights into the organization of the mental lexicon and can be employed as an alternative method to investigate other cognitive processes and shed light on the internal mechanisms of cognition. In addition, psycholinguistic research centring on the processing of the bilingual brain is likely to inform language teaching specialists regarding the best methods to use in second language teaching.

This section gave a brief definition of bilingualism, how the term ‘bilingual’ will be addressed throughout the text and the central role of bilingualism for the current research and the field of linguistics. Section 2.3. will attempt to define another key term for the study; ‘mental lexicon’ and discuss the issue by referring to various models proposed by linguists or applied linguists.

2.3. MENTAL LEXICON

Linguists, including the writer of this research study, have been intrigued by the question of how ‘mental lexicon’ is structured and how this organization can be explained and illustrated. Many attempts have been made to model the internal organization of the mental lexicon employing experimental techniques. Prior to the discussion of the proposed models, the definition of the term ‘mental lexicon’ needs to be addressed as a clarification regarding the terminology might help understand the issue more comprehensively. The term ‘mental lexicon’ was first put forward by Oldfield (as cited in Singleton, 1999) and much attention has been paid to the extension of the definition since then. Although it is difficult to find a comprehensive definition for the concept due to its abstract nature, it is a widely accepted overall definition by researchers and theoreticians that the representation of words in permanent memory in a systematic way is called mental or internal lexicon (Carroll, 2004). Singleton (1999) states that the internal lexicon is a component of human long term memory containing the language user’s all knowledge of the words in a language. In a recent definition by Roux (2013), the mental lexicon is regarded as “the collective representation of words in the mind, drawing together contextual, personal and interpersonal aspects of meaning, and helping essentially in the acquisition, retention and expression of language” (p. 82). The mental lexicon is essential because being devoid of its existence, producing the language would be challenging and strenuous and our thoughts would not be reflected correctly. Because of its abstract nature, mental lexicon is mainly compared to a printed dictionary, which is a more concrete concept in order to clarify the notion (Aitchison, 2003b). However, this analogy fails rapidly as one digs a little deeper and looks at the issue from a psycholinguistic perspective, it can clearly be seen and detected that the way humans use language is very complicated and it goes without saying that language use does not occur in a mechanical way or in a dictionary-like fashion. Dictionaries simply help people access words by their alphabetically ordered spelling, whereas lexical access is frequently accidental in a language (Fellbaum, 1998). As opposed to the alphabetical access in dictionaries, a word in our internal lexicon may be accessed in several ways. One way is a result of the perception of the word; if we see the word 'elephant' on a printed page, we identify it as a recognizable, familiar word and bring our knowledge of the word to bear on the task of comprehension. Alternatively, we activate meanings through other words, since all words conjure up the image of related words to varying degrees (Carroll, 2004). Furthermore, while the lexical items in a dictionary are static, the internal dictionary is dynamic in that languages are inclined to change over time and a language user's linguistic knowledge also seems to evolve (Aitchison 2003a), as a result of which the mental representations of lexical items alter and the new senses of the words are added. Another obvious difference between an actual dictionary and mental lexicon is the accessibility of the stored lexical knowledge. As opposed to a traditional dictionary where each lexical item is at your disposal at an equal distance of accessibility, the lexical nodes in the mental lexicon appear to have various degrees of accessibility. The factors contributing to this difference are considered as frequency, salience, imageabality, and concreteness (Kroll and De Groot, 2005). Last but not least, the traditional and the mental dictionary seem to differ in terms of the form of the stored information. To be more precise, the mental lexicon stores both linguistic and conceptual information, whereas a traditional dictionary includes only verbal information. At odds with the earlier positions, cognitive psychologists assert that the mental lexicon includes not only lexical items but also concepts. That is to say, mental lexicon consists of concepts and their linguistic realizations at the phonological and orthographic level, the access and retrieval of which prove the dynamic structure of the mental lexicon (Gabrys´-Barker, 2005). Jarema and Libben (2007) also emphasized the difficulty to define the term ‘mental lexicon’ and explained why linguists avoided setting the borderlines for the definition, claiming that any attempt to clarify the notion is likely to be incomplete. Accepting all the inadequacies of the attempts to define the term, they provided an overall definition:

> The mental lexicon is the cognitive system that constitutes the capacity for conscious and unconscious lexical activity (Jarema and Libben, 2007: p. 2).

What they believe is that research on mental lexicon should concentrate on conscious and unconscious lexical processing in the human brain, which is why they formed their definition of the term as in the quotation. In addition to its definition, the internal structuring of the lexicon needs scrutiny before discussing the models proposed up to now. The components of the internal structure of lexicon are vague and a still debated issue in the literature. Some models, details of which will be provided in the following section, highlight the semantic sub-lexicon as the sole internal lexicon, in which other possible components like phonology are merged (e.g. Carroll, 2004), whereas others assert that semantic and phonological components are separate (e.g. Garman, 1990). There seems to be other models which underline the semantic and phonological components but ignore orthographic ones (e.g. Levelt, 1989). However, it has been claimed by many other researchers that orthographic representation must be considered within the borders of the mental lexicon organization (e.g. Randall, 2007). There exists various different models and approaches that have been put forward by psycholinguistics and cognitive linguists trying to explain how the mental lexicon is structured; to be more precise, how lexical entries are organized and connected to one another in the lexicon. In Section 2.3.1., five core mental lexicon models, some of which will be scrutinized further in the discussion section in an attempt to provide a humble framework for cross-linguistic collocational processing based on the findings of the current research, have been summarized.

2.3.1. Models of Mental Lexicon

The following lines and figures attempt to summarize some of the important models of mainly monolingual mental lexicon, which were then exploited as stepping stones in the development of bilingual mental lexicon frameworks.

2.3.1.1. The Hierarchical Network Model

As far as the Hierarchical Network Model is concerned, all concepts are structured as interrelated nodes, or lexical entries. The prototypical; that is to say, the broadest concepts are represented at the top of the lexicon structuring. For instance, one can observe the concept ‘canary’ and other subheadings of ‘bird’ in a separate cluster of nodes on a lower level of the hierarchy. Every single item in the set is linked to the node for the more general concept; namely, the prototype. See Figure 1 for a visual representation.

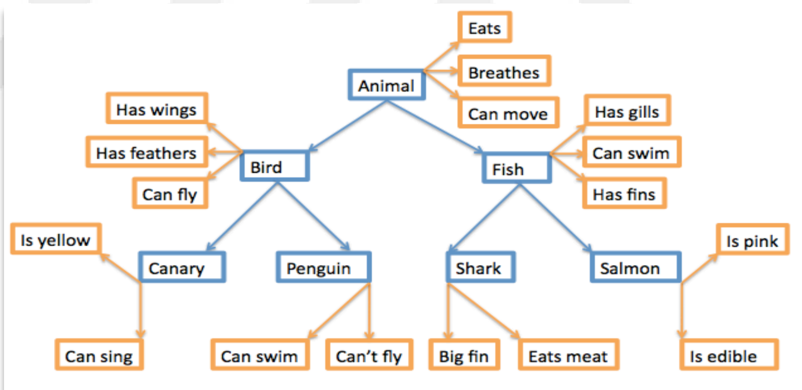


Figure 1 – Hierarchical Model (Collins and Quillian, 1969)

2.3.1.2. The Semantic Feature Model

In an attempt to reflect some of the limitations of models like Collins and Quillian’s (1969), Smith et al. (1974) put forward a model indicating the meanings of lexical items as groups of semantic features. These features can be classified as ‘characteristic’ and ‘defining’. Defining features can be regarded as the ones, which are fundamental while differentiating a concept from other members; to be more precise, their most salient feature. Characteristic features; on the other hand, are the ones, which are not considered vital. To illustrate, a defining feature of ‘ostrich’ is the fact that it has ‘long legs and neck’, whereas a characteristic feature indicates that it is ‘large’. That is to say, the fact that concepts share more defining features will bring about an organization where they stand closer in the mental lexicon. Therefore, with regard to the defining features shared between ‘ostrich’, ‘bird’ and ‘robin’, it can be seen that the concept ‘bird’ and ‘robin’ share three, whereas ‘bird’ and ‘ostrich’ share two, which addresses the fact that ‘robin’ would be categorized closer to ‘bird’ than ‘ostrich’. In contrast, a hierarchical model would cluster ‘bird’ and ‘ostrich’ evenly close to ‘bird’. In other words, it can be stated that Semantic Feature Model provides more flexibility and levels in connections between words. A further essential characteristic of this model is that the less abstract a concept is, the larger number of defining features it holds. In addition, the fact that it is more concrete makes it easier to interpret semantically compared with an abstract concept, which could also be regarded as one of its limitations since the model fails to explain how the mental lexicon is structured when processing abstract lexical items. See Figure 2 for a visual representation.

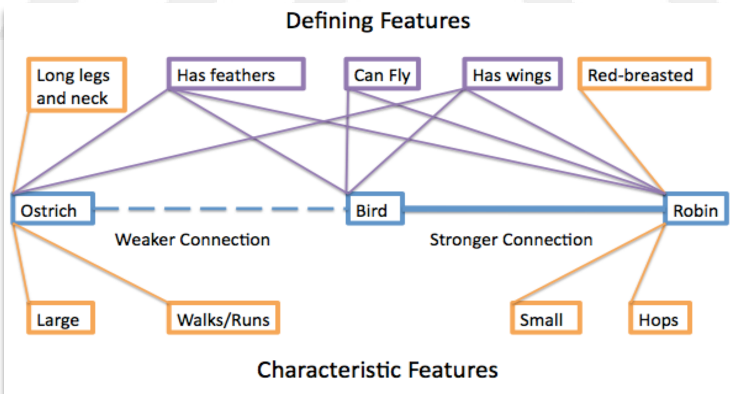


Figure 2 – Semantic Features Model (Smith et al., 1974)

2.3.1.3. The Spreading Activation Model

Collins and Loftus (1975) also brought forward certain limitations of their and all previous hierarchical models. They addressed some of the misapprehensions people were under regarding the model they put forward earlier and thus; they adjusted it so as to give the model a bit more flexibility. The inflexible hierarchy has been broken down, making it possible for the direct connections to be formed between any two lexical items. In this modified model, objects (e.g. mug), features (e.g. red), verbs (e.g. drink) and even the links between all of these are treated as concepts, with distinct nodes. There may be a link between any two words and the length of the link indicates how closely organized together those words are. See Figure 3 for a visual representation.

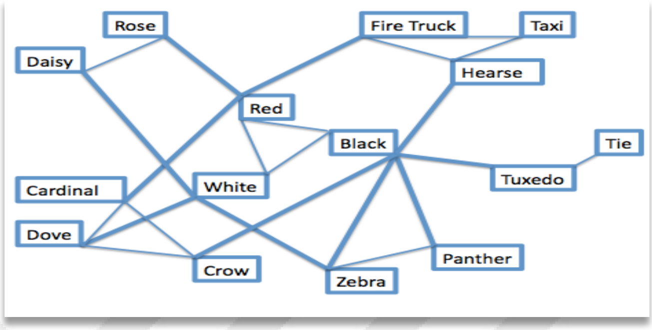


Figure 3 – Spreading Activation Model (Collins and Loftus, 1975)

As opposed to the 'feature' models, the rationale behind a spreading activation network is that when a lexical node is activated; that is, when you hear or see a word, it triggers the activation of the other related nodes, such as semantically related ones. Activation fades away over the length of the links and it continues to activate other nodes until it entirely disappears. The Spreading Activation Model has succeeded in explaining how 'priming' works on the whole for many models of the mental lexicon, underlining the fact that concepts in the lexicon prime each other by means of spreading activation. However, one limitation of the model according to some researchers was that the structuring of the mental lexicon becomes very idiosyncratic, i.e. changing individually. One more important point to consider about not only this model but also all the earlier models, which aim at representing the lexical organization, is that they fail to take features other than the meaning of words into consideration, such as their phonology, syntax, or morphology. In an attempt to address these factors, Bock and Levelt (1994) put forth a revised spreading activation model having separate levels of lexical entries. This model went on to highlight the semantic properties of words. See Figure 4 for a visual representation.

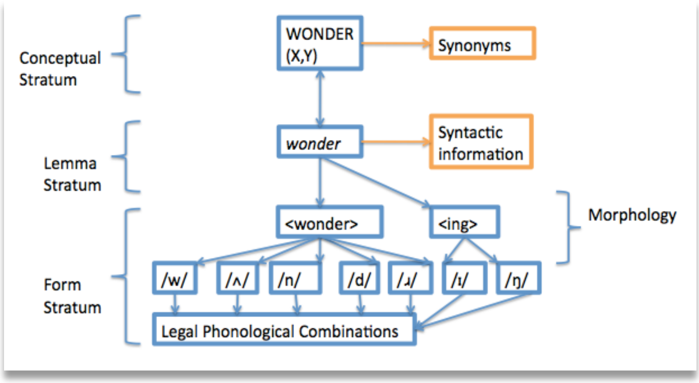


Figure 4 – Revised Spreading Activation Model (Bock and Levelt, 1994)

2.3.1.4. The Connectionist Approach

The models presented above seem to suggest that words are systematized in the mental dictionary according to their semantic relations. According to Seidenberg and McClelland (1989), we need to consider the fact that no localized ‘mental lexicon’ exists and that knowledge about words should be regarded as any other type of knowledge. Their Connectionist model is a parallel distributed processing model, which bear many similarities to the Spreading Activation Model. They further stated, “knowledge of words is embedded in a set of weights on connections between processing units encoding orthographic, phonological, and semantic properties of words, and the correlations between these properties” (Seidenberg and McClelland, 1989, p. 560). Consequently, once the properties (i.e. phonology, orthography and meaning) mentioned are triggered, the associations between them become more robust, just like neurons wiring together in the brain, so to speak (Brown and Milner, 2003). These associations bring about a bottom-up process by way of a few ‘hidden units’, which are linked to a lot more ‘input units’, standing for orthography, phonology and meaning. See Figure 5 for a visual representation.

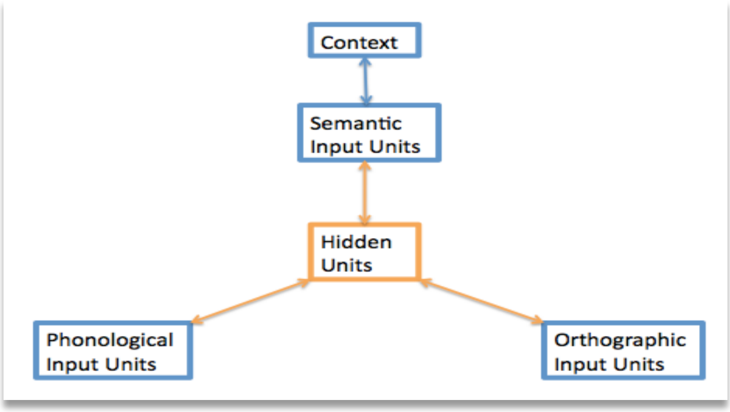


Figure 5 - Connectionist Model (Seidenberg and McClelland, 1989)

Just as important as the mental lexicon of the monolinguals and maybe a little more intriguing for the current research is the mental dictionary of the bilinguals. Since the current study explored subjects who are L1 Turkish and L2 English users, how the bilingual brain processes vocabulary is of vital importance. Section 2.3.2. expands the issue of mental lexicon and goes on to discuss the bilingual mental lexicon referring to earlier and recent models.

2.3.2. Bilingual Mental Lexicon

As the world globalizes every passing day and people learn and speak many different languages at the same time, researchers become more interested in bilinguals and multilinguals. One important issue that has attracted the interest of many linguists for the last twenty years is whether bilinguals have two separate mental dictionaries, how the mental lexicons of the bilinguals interact or whether they have no connection at all. In addition to the paradigmatic relations between the words studied over the years, recent studies focusing on vocabulary have attempted to shed light on the syntagmatic relations between the lexis and also how this relation seems to occur between the two different internal lexicons (Butler and Kenji, 2005). The primary concern of this study, which is a current issue in vocabulary research as well, is to model the bilingual mental lexicon during the lexical representation and lexical activation processes and draw some conclusions particularly in terms of the processing of collocations from a cross-linguistic perspective.

One of the recent controversial topics in the scope of mental lexicon research is about the lexical selection process. In order to account for this process, researchers have proposed two different models so far. There is an ongoing debate regarding if lexical competition is among the lexical nodes of the response language or each node competes with others, no matter what their source language is. The supporters of a language specific lexical selection (Costa and Caramazza, 1999; Costa et al., 1999) envisage that the selection device contemplates only the nodes that belong to the response language, though both the languages are activated. On the contrary, others who advocate a language non-specific model of lexical selection (Green, 1986; De Bot and Schreuder, 1993; Poulisse and Bongaerts, 1994; Hermans et al., 1998) believe that every single activated node enters into competition regardless of the context. The researchers (e.g. Costa et al., 1999) endorsing a model of language-specific lexical selection assert that although both the languages are stimulated, the words of the response language solely enter into competition for selection. They base their claims on experimental and observed results by highly proficient bilinguals in order to emphasize that as bilingual proficiency improves, they rely more on a language-specific selection mechanism. But, these authors do not seem to acknowledge the fact that their models do not offer any accounts in terms of bilingual code switching. The supporters of a language non-specific lexical selection, on the other hand, (e.g. Hermans et al., 1998) highlight that the two languages are competing in a real communication context, such as simultaneous translation and code switching. They build their assertions on empirical results indicating that planning how to speak is an interactive and non-selective process, and lexical candidates compete not only within but also between the two languages. As opposed to the advocates of the language specific lexical selection paradigm, they suggest that the serial activation mechanism and the selective lexical selection mechanism represent special cases, which could be witnessed only under certain circumstances.

Another important point to note is that non-selective-access assumption has weak and strong forms. The former asserts that even when a monolingual task is being performed, the language in the environment cannot be overlooked by the bilingual language user. Thus, it can be stated that linguistic performance seems to be influenced if the language input is available and perceived. Since a bilingual cannot consciously choose the language that is employed while doing the necessary task and disregard the other language in the setting, this version of lexical access is regarded as non-selective. The latter, on the other hand, suggests that a bilingual's both languages are operational at all times to varying degrees and that regardless of the language of the task being performed and the effect of the environment, both languages seem to have an impact on his/her linguistic performance. In consequence, it would be simplistic to say there is language selectivity in bilinguals or bilinguals process and use both languages at the same time. To be more precise, selective or non-selective lexical access may be affected by various factors and both languages of a bilingual may be at work at different proportions during language production. In the light of these discussions and controversies, there exits certain approaches and models proposed trying to visualize how the bilingual lexicon works during lexical processing. Section 2.3.3. will attempt to give a brief overview of the suggested models.

2.3.3. Models of Bilingual Mental Lexicon

In addition to the models representing the mental lexicon of monolinguals, some bilingual mental dictionary representations have also been put forward. These models attempt to explain how the vocabulary of two languages is processed and interact during language production. Some earlier and recent ones have been displayed and explained briefly below. Figure 6 displays one of the earlier examples.

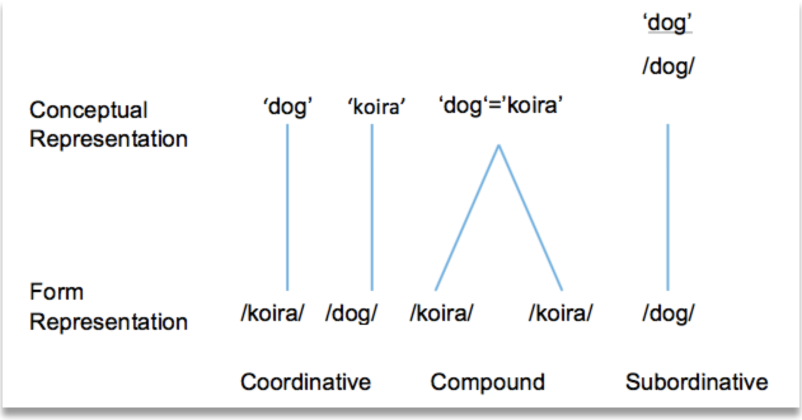
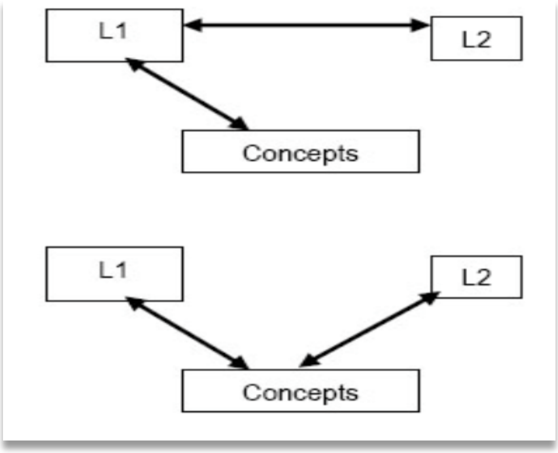


Figure 6 – Three Organizations of Vocabulary Knowledge in Bilingual Memory (Weinreich, 1953)

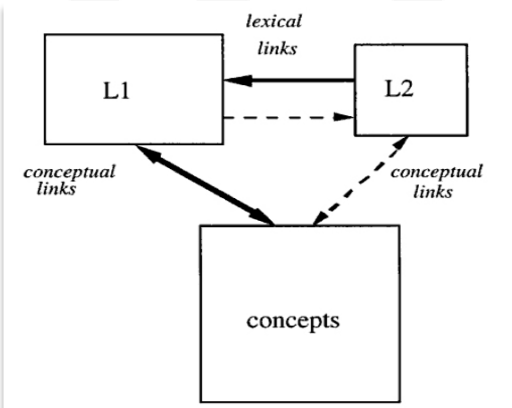
As stated in Grosjean and Li (2013), one of the earliest descriptions of internal lexicon was by Weinreich (1953). He strived to separate the word knowledge into three categories, which are ‘coordinative’, ‘compound’, and ‘subordinative’. According to him, in bilinguals with a coordinative type of word knowledge, a word in L1 and its equivalence in L2 have not only distinct form representations and a separate conceptual representation, as well. On the other hand, in compound bilinguals, although an L1 word and its L2 translation equivalent have distinct form representations, they share the same conceptual representation. Last but not least, in bilinguals having a subordinative sort of word knowledge, the form representation of an L2 word maps onto the corresponding L1 form representation. To be more precise, in subordinative bilingualism, access from an L2 word to conceptual memory is indirect. Weinreich’s model paved the way for “Concept Mediation Model” and the “Word Association Model” by Potter et al. (1984). See figure 7 for an illustration.



*adapted from (Pavlenko, 2009)

Figure 7 – The Concept Mediation Model and Word Association Model (Potter et al., 1984)

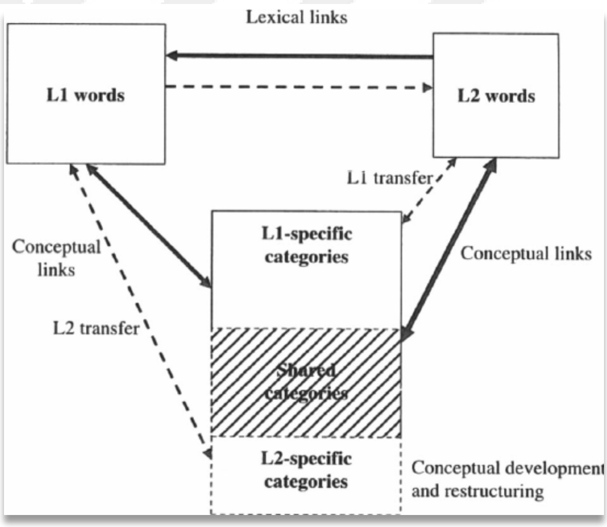
A later well-known depiction of bilingual internal lexicon, which still sets the base of much research and seems to be an extension of Potter et al.'s model, was by Kroll and Stewart (1994). See figure 8 for an illustration.



*adapted from (Pavlenko, 2009)

Figure 8 – The Revised Hierarchical Model – RHM (Kroll and Stewart, 1994)

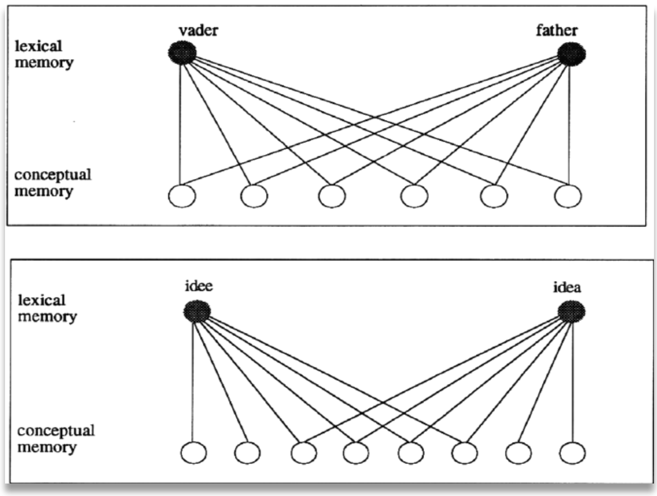
The model itself developed by Kroll and Stewart and much research built on the model indicate that in the early stages, there is a strong bond between L2 words and their L1 counterparts, which is shown by the dotted lines in the figure. As the L2 users become more proficient in their second language, the links between L2 words and concepts get even stronger and language users tend to depend more on direct links (Pavlenko, 2009). Two basic assumptions are reflected in the revised model. The two lexical systems in the bilingual brain are represented together at the conceptual level, but the systems are separate. To be more precise, an L2 word and its L1 counterpart are likely to be linked not only at the lexical level but also by way of the shared concept, though indirectly. Furthermore, how strong these lexical and conceptual links are changes; L1 concept connections seem to be more profound than L2 connections, and L2-L1 lexical connections appear to be stronger than the connections in L1-L2 direction. An extended version of this model, which included shared and independent conceptual categories, was also proposed in Pavlenko (2009). This feature can help discuss the congruence effect in the bilingual mental lexicon organization at the collocational level due to the shared and language specific domains in the framework. See Figure 9 for an illustration.



*adapted from (Pavlenko, 2009)

Figure 9 – The Modified Hierarchical Model – MHM (built on Kroll and Stewart, 1994)

The model seems to differ from other models in part although it includes many of their strengths. As an extension to RHM, the MHM keeps the developmental progression from lexical to conceptual mediation in L2 learning. Furthermore, it retains the idea of shared and partially shared representations, core features of the Distributed Feature Model - DFM and the Shared Asymmetrical Model - SAM. What is even more important is that the MHM appears to differ markedly from the other models in terms of organization of the conceptual store; that is, fully shared, partially overlapping or fully language specific; conceptual transfer, which highlights the difference between semantic and conceptual levels of representation (Pavlenko, 2009). A more recent model was “The Distributed Feature Model” (DFM). See Figure 10 for the illustration of DFM.



*adapted from (Pavlenko, 2009)

Figure 10 – The Distributed Feature Model – DFM (de Groot, 1992b, 1993)

As opposed to the above-mentioned model, DFM pays attention to cross-linguistic variation. The model asserts that bilinguals translate concrete words and cognates faster; namely, process them more easily than abstract words. To be more precise, the model displays that representations of concrete words and cognates are mostly shared across languages, whereas representations of abstract words share fewer semantic features. de Groot (1993) stated that the model could be seen more suitable for bilinguals whose L2 is highly advanced or who are acquiring their L2 in a natural context than bilinguals having learnt a second language in an artificial environment by associating L2 words with their L1 translations. In another model, titled “Shared Asymmetrical Model” (Dong et al., 2005), L1 and L2 mental dictionaries are linked not only to each other but also common conceptual elements. The model can be considered as successful in that it takes cross-linguistic differences and the vocabulary learning process into account. However, it is not clear in terms of the nature and structure of conceptual representation (Pavlenko, 2009). See Figure 11 for an illustration.

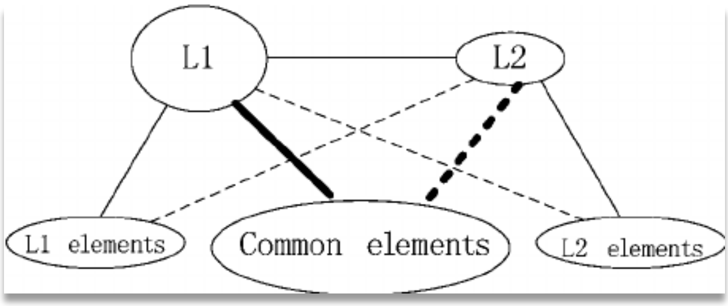


Figure 11 – The Shared Asymmetrical Model – SAM (Dong et al., 2005)

In one of the recent well-acknowledged models, on the other hand, Dijkstra and van Heuven (1998) assert that bilinguals have integrated lexicons. In line with the perspective of the other interactive lexical activation models, it incorporates the terms resting level, threshold level, parallel bottom-up activation, top-down feedback and inhibition in lexical access. What is important about the model is its claim saying that a language node exists in the mental lexicon which is linked to all the words within a language. In an integrated bilingual mental dictionary, there are two language nodes, both for L1 and L2. Once a word is activated, its activation spreads onto the equivalent language node, which activates all the words in the target language and inhibits the lexical items in the other language. “Bilingual Interactive Activation” (BIA) assumes that lexical access is language non-selective and that bilingual mental dictionary is integrated across languages. A more recent and advanced version of the model, the BIA+ was put forward by Dijkstra and van Heuven (2002). Basic characteristics of the previous model was kept, but two further layers were added into the representation; the semantic and phonological systems. Moreover, the extended version distinguishes between a word identification system and a decision system. It is asserted that that lexical access takes place in the word identification module, seems to be automatic and as a consequence, cannot be controlled by the language user consciously. See Figure 12 for the updated version, BIA+.

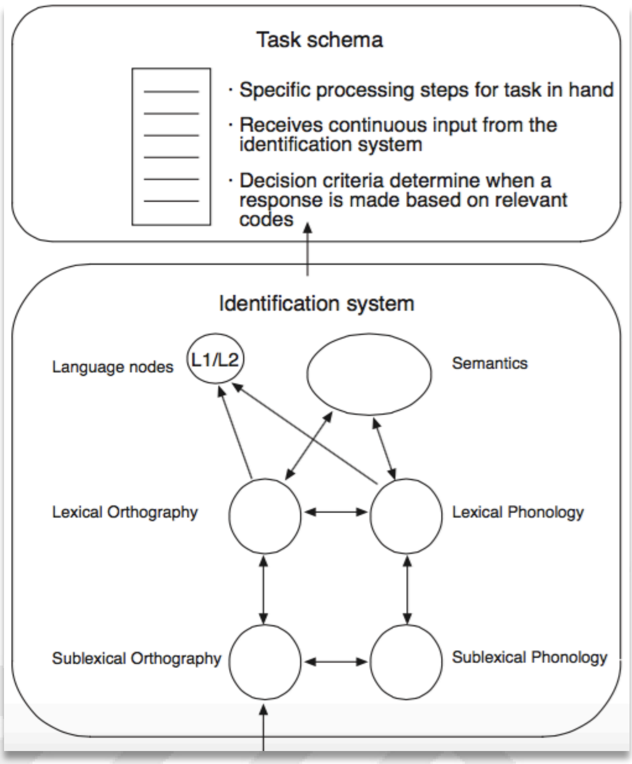


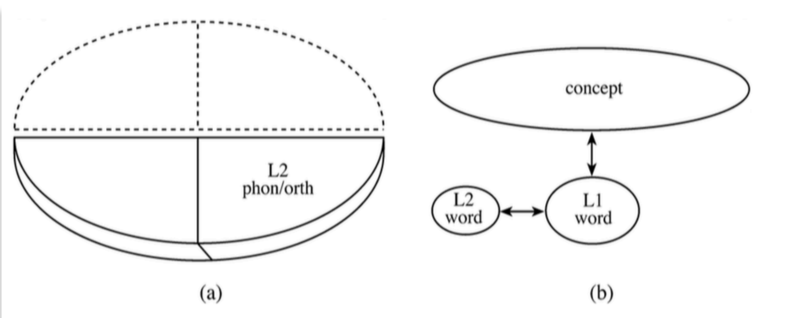
Figure 12 – Bilingual Interactive Activation+ (BIA+) Model (Dijkstra and van Heuven, 2002)

As summarized above, there are different approaches to visualizing the bilingual lexical processing; how the two dictionaries interact at the conceptual and representational level and during lexical activation and selection processes. The current research aims to integrate some of the approaches mentioned so far. To illustrate, having a language non-selective stand in bilingual language processing, the researcher makes use of the “Spreading Activation Model” by referring to a cross-linguistic syntagmatic relation between word combinations to explain the possible collocational spreading activation in the bilingual mental lexicon. It is assumed by the researcher that in a priming study, if a Turkish-English bilingual subject sees the first part of a collocation (i.e. priming word) in Turkish or English subconsciously, it will prime the collocate, or in other words the activation will spread to the other part of the combination in Turkish or English although there may be some factors affecting the spread, such as congruence, typology, and frequency which are also investigated in the study. In addition, the issue of congruence at the collocational level can be explained with the help of the Modified Hierarchical Model although the model approaches the mental lexicon organization from a paradigmatic perspective.

Another important framework the current research builds on is Jiang's (2000) "Lexical Representation and Development in L2" model. The framework is important because the subjects of the study that are exposed to the target language in two different settings are assumed to be at the second or third stage of their lexical development. The results of the study could yield supporting data and the framework will enable the writer to interpret the situation from a developmental perspective. While the explanation in Jiang's model is at the word level, the current study aims to add the collocational dimension to the explanation. Section 2.4. will try to introduce Jiang's developmental model.

2.4. THREE STAGES OF LEXICAL DEVELOPMENT IN L2

According to Jiang's model (2000) titled Lexical Representation and Development in L2, at the preliminary phase of lexical progress in L2, the use of L2 words requires the stimulation of the associations between L2 words and their L1 counterparts. To be more precise, when an L2 user at this stage hears a word, the corresponding L1 translation of an L2 word, following which comes semantic, syntactic, and morphological information, becomes accessible and makes comprehension possible. See Figure 13 for an illustration.



*all the figures in this section were adapted from (Jiang, 2000)

Figure 13 – Lexical representation (a) and Processing (b) at the Initial Stage of Lexical Development in L2

As one gains experience in L2, greater links are established between L2 words and their L1 counterparts. As a result, L2 word forms and lemma information of L1 equivalents are activated simultaneously during word use. Another important point to note is that at this stage, there seems to be a weak link between L2 words and conceptual representation as opposed to the first stage where there is almost no link between L2 lexical items and mental representations. See Figure 14 for an illustration.

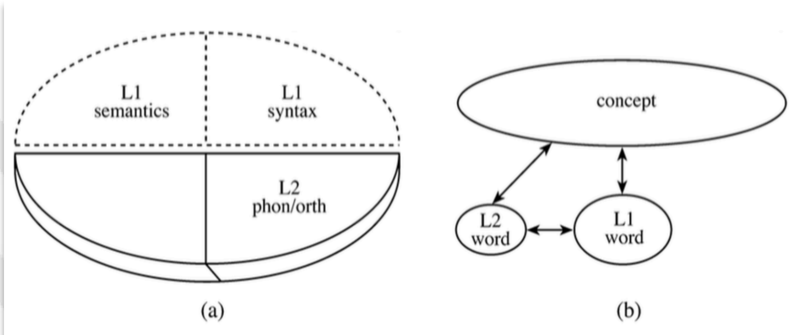


Figure 14 – Lexical Representation (a) and Processing (b) in L2 at the Second Stage

As for the third stage, one can observe that a lexical entry in L2 and L1 are almost alike in terms of not only representation but also processing and that morphology also comes into play and a direct link between L2 words and concept is evident. See Figure 15 for the last stage.

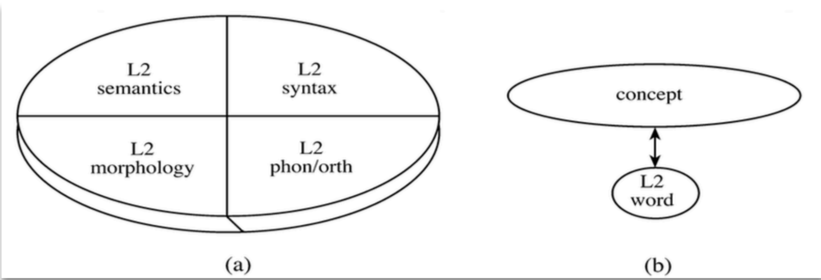


Figure 15 – Lexical Representation (a) and Processing (b) in L2 at the Third Stage

Overall, Figure 16 summarizes the process of L2 lexical development.

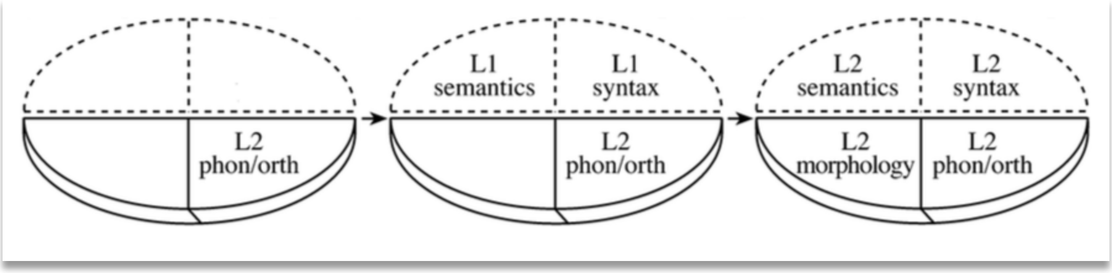


Figure 16 – Lexical Development in L2: From the More Formal Stage to the Integration Stage

Mental lexicon models presented so far have focused on single lexical items and looked at the issue from a paradigmatic perspective. The model in Section 2.5., which is one of the core theoretical frameworks the current study benefits from, concentrates on the mental structuring of words from a syntagmatic point of view. As opposed to the research by Wolter and Gyllstad (2011), out of which "Dual Activation of Collocational Connections Model" emerged, the current research adopts a cross-linguistic perspective in its priming presentation and looks at the issue from a different angle not only in terms of presentation but also the languages investigated, one of which is a typologically different and understudied language; Turkish.

2.5. DUAL ACTIVATION OF COLLOCATIONAL CONNECTIONS MODEL

Due to the lack of a to the point theoretical framework, Wolter and Gyllstad (2011) proposed the "Dual Activation of Collocational Connections Model" in an attempt to explain the impact of L1 on L2 collocational processing. In their research, they put forth the idea that congruent collocations in L1 and L2 are simultaneously activated in the mental lexicons of bilinguals. The primed lexical decision task they employed showed significantly faster reaction times to target words that were primed with words that formed congruent collocations over target words that were primed with words that formed incongruent collocations. The researchers suggested that faster reaction times might be rationalized by L1 collocational knowledge running in the background to help the processing of L2 collocations. To be more precise, they claimed that when one is presented with an L2 word, the word activates both known L2 collocates and L1 collocates. Overall, they assume that there is spreading activation from a word to its collocate and that there is a way in which L1 collocational knowledge can influence processing of L2 collocations. These findings and the method can be considered important on the grounds that no study before Wolter and Gyllstad (2011), to the writer's knowledge, has ever attempted to use the lexical priming technique to explore the collocational links in L1 and L2 as all the previous research focused mainly on paradigmatic relations of lexical items, such as semantics. Since this is one of the first studies investigating the impact of L1 on the processing of collocations in L2 by employing a collocational priming paradigm, the model proposed by the researchers is essential and needs further investigation. If it is true as the researchers claim that L1 collocational knowledge is processed in the background to assist the processing of L2 collocations, then these lexical items are likely to affect each other cross-linguistically. That's why the current research embraces the model and seeks for further proof for cross-linguistic collocational priming.

Before discussing collocations, some information about formulaic language needs to be given as collocations tend to be presented under the heading of formulaic language in the literature and the absence of the formulaic language account may result in missing the big picture. Section 2.6. will try to explain the concept of 'formulaic language', its importance and where to place collocations within the context of formulaic language.

2.6. FORMULAIC LANGUAGE

What Sinclair (1991) and Hoey (2005) proposed was much more than the psychological aspect of collocations. If one seeks to understand the principles behind the processing and acquisition of collocations, s/he needs to investigate the issue from a broader perspective because principles, which are acceptable for collocations, tend to spread beyond. 'Formulaic language', which is defined as 'recurrent multi-word lexical items or expressions that have a single meaning or function' is commonly used as an umbrella term for idioms, collocations, lexical bundles etc. and it would be incomplete to discuss collocations alone without exploring the general picture and questioning where to place collocations in this context. Researchers have approached the issue of formulaic language from various angles and named it in different ways; e.g. multi-word units/expressions, multiword chunks, fixed expressions, frozen phrases, and prefabricated routines, to name but a few. It is widely accepted by the researchers with a usage-based emergentist view of language that formulaic language is considered as one of the most central elements of language since it is pervasive in language use, meanings and functions are achieved through it and it has processing advantages. They further claim that it is a feature in many languages and that formulaic language seems to help speakers to be more fluent and because it is expected by the speech community, word combinations, which do not comply with the norm, sound ‘unnatural’ (Schmitt, 2010). Ellis et al. (2008) assert learners’ long-term knowledge of lexical sequences in formulaic phrases serves as database for language acquisition.

The fact that multiword expressions are pervasive in everyday language indicates that humans possess the capability to store a great number of prefabricated phrases (Sinclair, 1991). Ellis (2001) argues that these prevalent expressions are kept as ‘chunks’ in long-term memory and that language users find it easier and more practical to recall these word combinations rather than considering every lexical item separately, which is likely to result in a processing burden in the lexicon (Wray, 2012). In the light of these assertions and assumptions, a number of research studies with a psycholinguistic motivation have been conducted in an attempt to explore multiword expressions. A large scope of research has indicated that owing to their frequent use and salience, formulaic phrases are processed in a different way than single lexical units. Studies concentrating on prevalent word combinations, idioms, lexical bundles etc. have underlined the fact that multiword expressions seem to enjoy a processing advantage when they are compared with novel strings of words (e.g. Conklin and Schmitt, 2008; Siyanova and Schmitt, 2008; Bannard and

Matthews, 2008). This assertion stressing the influence of collocational or phrasal frequency on processing the language appears to shed light on linguistic studies exploring the nature of internal lexicon and language acquisition theories on the whole. Furthermore, it has been proposed that the processing advantage of formulaic phrases provide proof against the distinction between lexicon, which stands for a compilation of memorized forms, and grammar, which highlights a compilation of rules, in that both modules seem to interact and merge, as a result of which the expressions are processed as a whole (Siyanova-Chanturia, Conklin, and van Heuven, 2011). Rather, the findings are in line with usage-based models (e.g. Bybee, 1998) and exemplar-based models (e.g. Abbot-Smith and Tomasello, 2006), in which constructions are regarded as the fundamental component of language acquisition (Goldberg, 2006; Tomasello, 2003). As the theories suggest, all linguistic information is represented and processed similarly and frequency plays a key role in its processing. In addition, corpus data also proves that formulaic phrases are recurrently employed in everyday language (Sinclair 1991; Wray 2002). Research in corpus linguistics indicate that native language users exploit a great number of recurring multiword patterns or ‘formulas’. As Sinclair (1991) puts forward in the ‘Principle of Idiom’, a language user knows a huge number of semi-preconstructed phrases, many of which are uttered in speech and can be observed in texts. It is even estimated that about half of fluent native text is shaped based on idiom principle. Biber et al. (1999) stated that more than a quarter of spoken and approximately one fifth of written discourse is composed of multi-word expressions. Erman and Warren (2000) deduced based on their findings that almost half of the written discourse consists of formulaic expressions. It has been concluded that formulaic sequences, statistically defined and extracted from a large and balanced corpus, have indications for educational and psycholinguistic research and applications. There have been other attempts in addition to Sinclair (1991) suggesting the psycholinguistic reality of multiword expressions. For instance, Wray (2002) made some claims regarding formulaic phrases which were consistent with Sinclair’s idiom principle. As Wray states:

> A formulaic sequence is a sequence, continuous or discontinuous, of words or other elements, which is, or appears to be, prefabricated: that is, stored, retrieved whole from memory at the time of use, rather than being subject to generation or analysis by the language grammar. (Wray, 2002: 9)

The reason why researchers concentrate on formulaic language emerges from the viewpoint that formulas are basic language units. This theoretical stance is affected by Sinclair's (1991) Idiom Principle and by Pattern Grammar (Hunston and Francis, 2000), and Construction Grammar (Goldberg, 2006). Another rationale comes from the theoretical position that formulaic expressions have a unique psycholinguistic status and that they have a vital role in language acquisition. Last but not least, the investigation of formulaic language is of importance due to the fact that there may be a link between the learners' use of formulaic language and their perceived proficiency in language (e.g. Staples et al., 2013), though no conclusive results have been observed based on empirical research.

Another issue which is also scrutinized in the current study and has important implications for the processing of formulaic expressions is frequency; a notion that is prevalent in corpus linguistic approach to language acquisition and plays a key role in natural language processing. Ellis (2002a) states rather than a set of grammar rules, language needs to be regarded as statistical amassing of experiences altering whenever a language user encounters a certain utterance. He further claims that language users are remarkably sensitive to the frequency of lexical items or phrases and that the influence of frequency is one of the strongest variables in psycholinguistic research. Some researchers even claim that frequency is likely to be the key element shaping the structuring of the mental lexicon. It is emphasized with this notion that all frequent lexical items (i.e. phrases, collocations etc.) are processed faster than less frequent ones. The view can be considered compatible with connectionist approaches to language acquisition and processing, which is in line with the core philosophy of the current research. The approach underlines statistical properties of the input in language acquisition or learning. Language needs to be regarded as a statistical collection of experiences evolving each time a specific utterance is faced. Usage and exemplar-based approaches to language processing suggest that mental representations in the internal lexicon are shaped with the help of language use (i.e. frequency) (Goldberg, 2006; Bybee, 2006). As far as the collocations are concerned, it can be said that in spite of the remarkably creative nature of language, a number of lexical items tend to co-occur with some words more frequently than other lexical items and these co-occurrences appear to be prevalent in language use (Siyanova-Chanturia, 2013).

Based on probabilistic language models, statistical information regarding frequently co-occurring word combinations is represented in the mental lexicon. Very similar to smartphones and internet search engines predicting users' phrases or sentences, while processing the language, the brain uses the capability to employ this statistical accumulation to predict the likelihood of presence or co-occurrence of specific words (Seidenberg and MacDonald, 1999). Moreover, it must be underlined that adding a word into mental lexicon requires integrating its adjacent context (McDonald and Shillcock, 2003). One of the earlier research on formulaic language processing was conducted by Sosa and MacFarlane (2002), who observed two word combinations including the preposition 'of' and having different frequency values (e.g. 'sort of' and 'kind of'). The findings indicated that reaction times to the preposition 'of' was lower when the frequency of the collocation was high, showing the possible influence of frequency on collocational processing. They concluded that frequently co-occurring word combinations were processed as a chunk, resulting in hindrance to access the single parts of the collocation. Another study by Arnon and Snider (2010) also explored the effect of collocational frequency in four-word combinations which are fully transparent. They deduced after a phrasal decision task that the more frequent the phrases are, the faster they are processed. They claimed as a result that language users recognize, acquire and accumulate frequency information in semantically transparent phrases, in particular. A more recent research by Tremblay et al. (2011) stated that sentences containing lexical bundles were read faster than sentences with control chunks based on a self-paced reading task. Additionally, it was more probable to recollect those bundles accurately, which could indicate that frequent phrases tend to leave memory traces in the internal lexicon. To fill a niche in the domain of lexical processing of multiword expressions in L2, Siyanova-Chanturia et al. (2011) attempted to compare the sensitivity of native and non-native language users to the frequency of multiword expressions. There was a correlation between proficient non-native speakers and native speakers' reaction to frequency, but the same trend could not be observed in low level language users. They claimed based on the results that every single occurrence of a lexical unit promotes the entrenchment of that unit in the internal lexicon.

In addition to the studies exploring lexical processing from a comprehension perspective, there have been studies attempting to explain the processing advantage multiword expressions enjoy during language production. In one of the earlier examples, Van Lancker et al. (1981) stated that novel phrases lead to a longer processing time than formulaic phrases in that language users had more frequent and longer hesitations and that the constituent parts of the phrases were uttered more slowly. The findings indicating a difference between the processing of formulaic phrases (i.e. multiword expressions are processed faster) and novel phrases lead to two key implications in terms of linguistics theory. For one thing, it seems that when a psychological event takes place, it tends to leave a trace in a language user's memory promoting a processing advantage in the following uses. The more frequently an expression is observed by a language user even if it has a complex structure, the more likely that expression is routinized or automatized and processed more easily as it is represented as a chunk in the mental lexicon (Segalowitz, 2003). Langacker (1987) suggested that a formulaic phrase represented in the mental dictionary of a native speaker is practiced and grasped so comprehensively that the structure is processed automatically; that is to say, the language user does not need to pay attention to the separate parts of the phrase. Therefore, it can be assumed that owing to their frequent co-occurrences, formulaic expressions are entrenched in the mental lexicon of native speakers. The same facilitation can be observed to a lesser degree in non-native speakers since they are exposed to these expressions less. Bod (2006) asserted that statistics (i.e. frequency) is playing a crucial role in the assignment of representations to linguistic units and therefore language needs to be seen as a statistical accumulation of linguistic experiences altering each time a language user encounters a certain lexical item or phrase rather than a collection of particular grammar rules. Consistent with the studies adopting reaction time applications, research employing eye-tracking techniques have confirmed that formulaic language enjoys a processing advantage when compared with novel language units. In addition to the eye-tracking approaches, event related brain potentials (ERP), which is a neurolinguistics technique, have been employed in studies exploring the processing of multiword expressions in L1. It is claimed that ERPs have the potential to provide a direct reflection of the cognitive practices responsible for language processing (Siyanova-Chanturia, 2013). The question of whether similar or distinct neural practices are involved during lexical processing in L2 is still unanswered and requires a comprehensive investigation.

As is discussed, the correlation between formulaic language use and language proficiency is one of the scrutinized issues. It is claimed by researchers (e.g. Chen and Baker, 2010; Cortes, 2004) that there is a relationship between the use of formulaic language by learners and their language proficiency. Al Hassan and Wood (2015) investigated 65 formulaic expressions in students' responses to an IELTS[10] writing task. The findings indicated that the more formulas were exploited, the higher scores the texts received. Staples et al. (2013) explored the formulaic expressions employed in students' responses to a TOEFL[11] writing task with different scores. They concluded that lower level texts included more repeated formulaic expressions and that lower level texts made use of the lexical bundles provided in the question prompt more. Biber and Gray (2013), on the other hand, approached the issue from a different angle by focusing on both written and spoken responses of learners. Their results were similar to the

[10] International English Language Testing System
[11] Test of English as a Foreign Language

previous research in that a number of the lexical bundles exploited were copied from the question prompts. However, as for the relationship between the number of lexical bundles and the level of the responses, their results were more complicated than earlier research stating that the texts which were scored as medium level included more lexical bundles than low level and high level texts. This pattern was attributed to the developmental process of language learners. That is to say, low level language users are not aware of lexical bundles, intermediate level ones are eager to use the newly acquired bundles in context, though a bit excessively, and advanced ones use bundles moderately but also try to be more creative in their lexical choices.

There have been attempts in the Turkish setting as well investigating formulaic use in written and spoken production. For instance, Gungor and Uysal (2016) explored the variations in the lexical bundle use in L1 and L2 research studies in English. The results indicated an obvious difference between the texts written in L1 and L2 in terms of formulaic language use. Research written in L1 English had more noun and prepositional phrases, whereas the ones written in L2 English had more clausal lexical bundles. In another study, Öztürk and Köse (2016) compared the use lexical bundles by native English postgraduate students with non-native students and academicians. They compiled a small size corpus to explore the difference and the results showed that non-native students tended to employ considerably more lexical bundles than native speakers. It was also concluded by the researchers that the token frequencies revealed a redundancy in the use of lexical bundles by non-native speakers indicating an overuse in most of the chunks. The two studies summarized had overlapping results. Ortaçtepe (2013) explored the nativelikeness of the Turkish students in the USA based on their formulaic language use. Her findings demonstrated that American students employed more formulaic expressions in their spoken production as opposed to the earlier studies discussed above which revealed more formulaic language production by non-native language users in writing, despite redundancy. She concluded that production of lexical units which do not conform to the well-established formulaic language norms seem to result in non-native like language production, which will prevent non-native speakers from attending the native language community. Üstünbaş and Ortaçtepe (2016) approached the issue of formulaic language processing from a different angle by exploring the issue in the context of oral exams. They mainly investigated the correlation between the use of formulaic expressions in oral proficiency exams and the overall proficiency levels of the students. The results indicated a strong relationship between formulaic language use and overall proficiency. That is to say, as they stated the more formulaic expressions were employed, the higher the students' proficiency was. Durrant (2013) discussed the issue of formulaicity in Turkish by studying complex inflectional patterns. The findings indicated that due to its rich morphology, formulaicity plays a key role in the Turkish language. He claimed that the psychological models which have recently been put forward regarding agglutinative languages may need reconsidering. He gave some humble suggestions to those who are responsible for designing Turkish as a foreign language courses.

The importance of formulaic language in second language acquisition and its effect on L1 and L2 processing is still debated and further research is necessary to come up with conclusive remarks. As Ellis (2003) stated second language processing and acquisition seem to differ from first language in that it is comprised of processes of not only construction but also reconstruction. Having this notion in mind and being aware of the fact that formulaicity has received little attention in the Turkish context, the writer of the current research aims to concentrate on collocations, a member of formulaic language family and discuss the possible cross-linguistic processing differences in the bilingual mental lexicon. Section 2.6.1. will try to define collocations by referring to two key approaches and summarize some research adopting collocations as their main focus.

2.6.1. Collocations

A type or a sub-branch of formulaic language, collocations are omnipresent in language and language users employ these word combinations pervasively. As Cruse (2000) illustrates, the vocabulary of a language is organized based on two primary relations: paradigmatic and syntagmatic. Collocations can be classified under the heading of syntagmatic relations as opposed to synonyms, antonyms etc., which reflect paradigmatic structuring. See Figure 17 for an illustration.

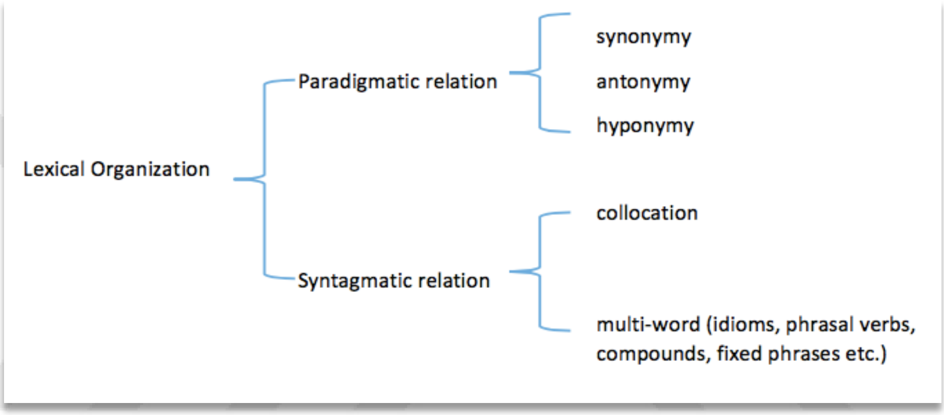


Figure 17 – Lexical Organization Chart (Cruze, 2000)

The former relation stands for semantic choices at a particular point in a sentence, but the latter highlights the syntactic relationship between intimate items. Besides syntactic relationship, some researchers also claim that words' typical collocates are believed to reflect essential information about its semantics. To be more precise, different senses of an ambiguous word do not pose a problem in context since the company it takes gives away the correct sense (Bartsch, 2004, p. 72). With regard to the differing definition of collocations, Firth, who is regarded as one of the first linguists to use the term 'collocation' in its modern linguistic sense, says:

> Meaning by collocation is an abstraction at the syntagmatic level and is not directly concerned with the conceptual or idea approach to the meaning of words. One of the meanings of night is its collocability with *dark*, and, *of dark*, of course, collocation with *night*. (Firth, 1957: p. 196)

Following Firthian tradition, linguists investigating collocations have adopted different aspects of Firth's ideas and put forward some other definitions. Sinclair (1991) defines collocations as the occurrence of two or more words within a short space of each other in a text, which can be considered as a textual interpretation. Leech (1974) says "collocative meaning consists of the associations a word acquires on account of the meanings of words, which tend to occur in its environment" (p. 20), which could be regarded as psychological or associative definition. This definition seems to be in line with Firth and Aitchison's (2003b) perspective. Last but not least comes Hoey's (1991) point of view of the issue. He states "collocation has long been the name given to the relationship a lexical item has with items that appear with greater than random probability in its contextual context" (p. 6-7). This could be considered as the statistical definition of the term, which is mainly favoured by corpus linguists. See Figure 18 for a brief summary.

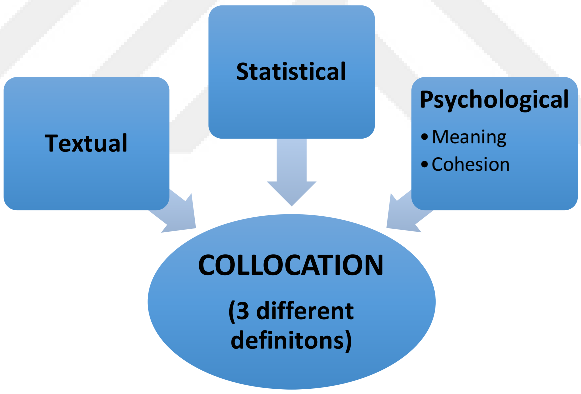


Figure 18 – Three Different Definitions of Collocations

As stated earlier, collocations are often viewed as a subcategory of formulaic language (Hoey, 2005; Sinclair, 1991). In spite of their seemingly pervasive use in language, collocations are infamously challenging to define (Wolter and Yamashita, 2014). In addition to the individual attempts to define collocations, there have also been two widely acknowledged approaches to the concept of collocation in the literature, the first of which is entitled the phraseological approach (Cowie, 1994; Howarth, 1998). According to this approach, a combination of words can be regarded as a true collocation only if at least one of the words in that combination is used in a semantically non-transparent way (as in ‘run a business’). If both or all the words in the string are transparent; in other words, hold their literal meanings, they are classified as free combinations (as in ‘read a book’). An earlier explanation of the classification by Benson et al. (1986) state that word combinations are categorized based on three main criteria, which are degrees of ‘cohesiveness or range’, ‘semantic opaqueness’, and ‘frequency’. The problem, however, with the classification is that the criteria can be along a continuum and it is difficult to determine the borderline between the three categories. According to the researchers, free combinations are encountered most frequently. Their constituents seem to co-occur freely with the widest range of other lexical items. To exemplify their remarks, they present the noun ‘murder’, which can stand next to many verbs, such as ‘to analyse’, ‘boast of’, ‘condemn’, ‘describe’, ‘disregard’, ‘film’, ‘forget’, ‘remember’ and so on. These verbs, on the other hand, can co-occur independently with other nouns like ‘accident’, ‘adventure’, ‘discovery’, ‘event’, ‘experience’, etc., which is a feature distinguishing them from collocations or idioms. As they state, idioms consist of much smaller cluster of word combinations, whose meanings do not seem to reflect the literal meaning of their constituents and are regarded as ‘frozen expressions’. To illustrate, ‘kick the bucket’ stands for ‘die’ and its constituent parts by themselves do not suffice to explain the underlying meaning, which is figurative. Collocations, on the other hand, stand in-between free combinations and idioms in that the meaning of the whole reflects the meaning of the constituents and either constituent is relatively fixed, though not completely. To give an example, ‘commit a murder’ can be seen as a collocation. Although one of its constituents can be replaced by ‘perpetrate’, the combination ‘commit a murder’ is much more frequent than the latter.

The second widely accepted approach has its roots in corpus linguistics and it relies mainly on statistical measures in order to determine the frequency of the co-occurrence of certain word patterns (Sinclair, 1991). The idea behind frequency is the fact that the more frequent strings of words appear together in written or spoken discourse, the more likely they are entrenched and can be considered as collocations, which native speakers or bilinguals produce automatically, without giving much thought and that is how fluency is achieved. As Henriksen (2013) states, employing the corpus approach can be considered advantageous in that objective criteria such as frequency, range and collocational span are used. However, the downside of the approach is the fact that it concentrates on performance but not competence (Howarth, 1998) and that it ignores core aspects of memory storage and language processing. Disregarding semantics may well result in identifying lexical chunks native speakers would not see as collocation. In other words, word pairs or groups are likely not to have strong psycholinguistic legitimacy for the language users. However, semantic relations between words are taken into account in the more subjective phraseological approach, though the frequency of the constituents is overlooked. Although they are semantically meaningful and seen as real collocations by the native language users, some could be low in frequency and would not give the best experimental items for second language researchers. Having this notion in mind, the researcher of the current study attempts to integrate both the approaches into his research as many other researchers in the field do. Therefore, 'collocation' for the current study is defined as frequently co-occurring two word combinations with a frequency value of at least MI=3.0 and *t*-score=2.0 based on the recommendations by (Schmitt, 2010), which are semi-transparent and thus it can be stated that frequency based and phraseological approaches are merged due to methodological purposes and the theoretical concerns discussed above. A number of earlier research studies (e.g. Kjellmer, 1984; Kjellmer, 1987) make use of both approaches, firstly pinpointing the recurrent word combinations in a balanced corpus [COCA (Davies, 2008) and TNC (Aksan et al., 2012) in this case] by means of statistical measures[12] and afterwards shortlisting the chosen word pairs according to their semantic features, such as transparency etc. This mixed approach could be seen as the most solid strategy considering the plus and minus sides of each approach, particularly for those who are researching second or foreign language acquisition (Henriksen, 2013).

[12] See Section 3.4.1.1. for collocational frequency measures.

With regard to some research conducted to investigate collocations, researchers appeared to scrutinize in two types, which are lexical and grammatical collocations. Syntagmatic relations between nouns, verbs, and adjectives can be given as an example for lexical collocations (e.g. heavy rain, do homework, make a mistake, etc.). The latter can be illustrated by words with prepositions (e.g. succeed in, provide with, happy with, etc.). A great number of research studies explored VERB+NOUN (V+N) word combinations (e.g. Gyllstad, 2007; Koya, 2005; Howarth, 1998; Laufer and Waldman, 2011). They mainly investigated restricted, semi-transparent collocations assumed to pose a difficulty for second language learners (Nesselhauf, 2003, 2005). In addition to V+N word clusters, some other researchers investigated ADJECTIVE+NOUN (ADJ+N) word combinations; either focusing on one collocation type or a range of co-occurring lexical items (e.g. Siyanova and Schmitt, 2008; Fan, 2009; Barfield and Gyllstad, 2009; Wolter, 2006; Wolter and Gyllstad, 2011). The current research primarily seeks to examine both V+N and ADJ+N collocation processing in an attempt to discover the difference between the two, considering the differing typologies of Turkish and English, which is the one of the core subjects of investigation.

Besides collocations with different parts of speech, some cross-linguistic studies attempted to investigate congruent and incongruent collocations since it was assumed that they could be processed differently, which could give some ideas about the varying conceptual representation in the languages studied. Section 2.6.2. will explain the difference between congruent and incongruent collocations by giving some examples from English and Turkish as well as discussing some related research.

2.6.2. Congruent vs. Non-congruent Collocations

Formulaic sequences, which seem to be a much more deeply studied subject than collocations, are frequently unique to a specific language. To be more precise, a formulaic expression in English, for instance, may not have a direct counterpart, which contains the same lexical items in Turkish. To give an example, the formulaic expressions ‘make up your mind’ or ‘look forward to’ do not have a word-by-word Turkish counterpart. Thus, learning these formulaic phrases for a native Turkish speaker is just like learning a new lexical item in English. On the other hand, collocations have a cross-linguistic nature; that is, a collocation in one language tends to have a corresponding member in another language unless a culturally different concept interferes. To illustrate, almost every language has a collocation similar to ‘heavy rain / sağanak yağmur’ although the adjective choice or whether it is characterized as a single semantic item might change. There may be identical lexical combinations or some items may differ in part. To exemplify, both English and Turkish have the same collocation of ‘cold war / soğuk savaş’; however, the collocation ‘high hope / büyük umut’ does not seem to reflect the same tendency. Likewise, the collocation ‘make a mistake / hata yap-’ has identical members in both languages, but the collocation ‘spend time / vakit geçir-’ differs partially.

This cross-linguistic distinction is explained with the help of the terms ‘congruent and incongruent’ collocations in the second language acquisition literature. The former consist of the same lexical items in both languages, and the latter contain different words. The flexible and cross-linguistic nature of collocations makes them intriguing for language researchers and brings about serious consequences in terms of second or foreign language acquisition. In addition, this flexibility has an influence on their salience in that they are less salient as word combinations. That’s why their low salience and incongruence of certain ones may result in high first language influence. Such impact may sometimes be advantageous but may hinder the language processing as well (Wolter, 2006). Thus, how congruent and incongruent collocations are stored and processed in the bilingual mental lexicon, whether and to what extent those corresponding lexical items interact in the bilingual mental dictionary are issues worth investigating to shed light on the psycholinguistic nature of cross-linguistic lexical access. Regarding the L1 effect on the acquisition of collocations, Yamashita and Jiang (2010) conducted an experiment with a phrase-acceptability judgement task in an attempt to observe different groups of language users; lower proficiency L2, higher proficiency L2, and native speakers of English. They found that L1 congruence plays an important role in acquiring collocations in L2. They stated that not only L2 exposure but also L1 congruence have an impact on how collocations are acquired and that when collocations are entrenched in the internal lexicon as lexical units, they may be processed independently (i.e. without L1 influence). A limitation of their study could be seen as the number of the collocations exploited. In addition, their claims regarding the influence of congruence on the acquisition of collocations needs to be confirmed with the help of learners from different L1 backgrounds, which is Turkish for the current study. In another study with a similar focus, Nakata (2007) attempted to explore the potential different effects of two task types (meaning focused vs. form-focused) on the acquisition of congruent and incongruent collocations. Following and prior to the intervention, learners were given a test to compare the difference between the two instruction methods. The findings indicated that form-focused activities resulted in better scores in the tests than meaning-focused tasks, particularly for the incongruent collocations. He tentatively stated that acquiring congruent collocations seem to be easier than non-congruent collocations.

Research on different types of collocations approaching the issue from either acquisition, learning or processing aspects seems to be abound in western academia; however, related studies in the Turkish context appear to be scarce. Section 2.6.3. will try to summarize some attempts to explore collocations in Turkey.

2.6.3. Research on Collocations in Turkey

There have been some attempts in Turkey to study collocations primarily within the context of languge teaching or with a corpus-based approach trying to illustrate the use of various word combinations in certain contexts. For instance, Özkan (2007) explored the collocational patterns of adverb+verb combinations in Turkish with the help of a self-compiled small size corpus. He drew some conclusions based on the role they play in sentence structuring and meaning making. As a result, he gave some humble suggestions regarding first language acquisition. In a corpus-oriented study, Çelik (2009) examined the influence of data-driven learning on L2 users' collocational competence. His findings revealed that learners exploiting corpus tools to learn vocabulary outperformed the control group in the collocation test and he concluded that data-driven learning appeared to be an effective method in teaching vocabulary and also improved learners' overall language competence. In another study, Vural (2010) investigated the learning of verb+noun collocations under different experimental conditions. He concluded that teaching collocations explicitly was more efficient than teaching them implicitly for foreign language learners. He further claimed that explicit instruction was the only method that did not lead to attrition in the recognition of the exploited collocations. Last but not least, he added that incidental instruction seemed to be effective for collocations with high frequency only. Bıçkı (2012) approached the issue from a slightly different angle and examined the collocational mistakes of EFL (English as a Foreign Language) students in academic writing seeking to look into the effect of L1. He worked on students essays and classified their collocational mistakes mainly based on grammatical accuracy and felicity. He concluded that learners made mistakes when producing semi-restricted collocations and that L1 had a big influence on this tendency. Ördem (2013) studied academic texts within the context of social, health and physical sciences comparatively to look into patterns of verb+noun collocations with various frequencies. He concluded that the collocations in health and physical sciences seemed to correlate in terms of their frequency, whereas the pattens in social sciences revealed significant differences. In another study with a language teaching perspective, Öztuna (2014) explored the efficiency of certain tasks acquiring different levels of involvement on teaching collocations to EFL students. She found contradictory results with the common theoretical thinking with the help of collocation retention tests and added that online tasks were more effective than others in teaching collocations. In a more recent study, Kurtuğlu (2015) attempted to identify the frequently employed noun+verb collocations in a coursebook used to teach Turkish as a foreign language. She classified the collocations based on how restricted the combinations were and frequency. She claimed that the corpus extraction based on certain criteria contributed to the linguistic literature in the Turkish setting as the collocations were listed and categorized according to their semantic and statistical values. In addition, she stated that the list could help those teaching Turkish as a foreign language in setting up their course syllabus and determining the target collocations to be exploited. In one of the more recent attempts, Demir (2016) attempted to detect similarities and differences between English native writers and L2 English Turkish writers in terms of how they employ collocations. He compiled a corpus of academic articles by Turkish and English writers with a proportional size. He concluded that English native wirters employed considerably more collocations in their studies than non-native writers and proposed a humble list of collocations which he thought L1 Turkish-L2 English writers could exploit in their future endavours. A more linguistic oriented study by Eken (2016) summarized the approaches to the definition and classification of collocations in the literature. She also emphasized the use of mixed methods embracing both statistical and phraseological approaches in determining collocations and setting the boundaries for different types of word combinations and lexical expressions.

The studies conducted so far exploring collocations in Turkey appear to concentrate on the learning and teaching aspects of the phenomenon. In addition, there are some studies extracting collocational patterns from corpora and making claims regarding the type of registers they are employed. However, studies scrutinizing the processing of collocations and what role they play in the organization of the mental lexicon; that is, approaching the issue from a psycholinguistic or cognitive linguistic perspective seem to be missing. Before touching upon the key investigation of this research, lexical and collocational priming, another critical issue that should be scrutinized other than the learning and use of collocations by L2 users and may be more central to the focus of this study is how collocations are processed in L1 and L2, the factors affecting the process and if/how they interect in the mental lexicon. Section 2.6.4. will give some insights into the acquisition and processing of collocations and formulaic expressions as well as the factors influencing collocational processing.

2.6.4. Factors Affecting Collocational and Formulaic Language Processing

Linguists who are interested in language acquisition and phraseology in particular have underlined the fact that multiword expressions set a perfect environment to explore lexical processing and representation in the mental lexicon in L1 and L2 due to their frequent use in language production, familiarity, predictability and salience. A lot of methodologies and paradigms have been put forward and employed to investigate the processing of formulaic expressions, such as self-paced reading, lexical decision tasks to test priming, elicitation tasks, eye tracking and so forth. In research studies, both comprehension and production of a language in L1 or L2 have been scrutinized by using these methods. One of the most commonly exploited variables in those studies was frequency as it is believed to play a key role in lexical processing not only in L1 but also in L2 (Ellis, 2002a; Wray, 2002). However, although frequency is considered an important factor affecting processing (both in L1 and L2), it is not enough by itself to explain the processing of formulaic expressions as a whole. There seems to be other contributing factors, some of which could be proficiency in a language if formulaic language use in L2 is investigated, salience, semantic transparency, congruence, L2 exposure, and the effect of L1 etc. Wolter and Gyllstad (2011), for instance, explored the effect of L1 intralexical knowledge on the construction of intralexical collocations. They employed a primed lexical decision task with non-native speakers as the experimental group and native speakers of English as the control group. They had congruent and non-congruent collocational items to test if congruence was playing a role. Their results indicated that L1 plays a major role in the processing of collocations in L2 English. In addition, they concluded that congruent items were processed faster than incongruent ones, indicating a processing advantage for non-native language users. In a more recent study by

Wolter and Gyllstad (2013), the effect of congruence as well as frequency was evaluated. The researchers used an acceptability judgement task and had native English and advanced non-native language users as their participants. Their findings demonstrated that advanced L2 English users were sensitive to frequency influence while processing collocations. Since congruence was found as a factor facilitating processing and it related to continued L1 influence, they claimed that usage-based models of language processing may not suffice to explain collocational processing in L2 and other explanations need to be investigated. In another study with similar aims, Wolter and Yamashita (2014) explored the influence of L1 on L2 collocational processing. They found no lexical priming for incongruent collocational items based on the results of a lexical decision task and they discussed some of the theoretical issues in the domain of collocational processing in L2 and the effect of L1.

Gyllstad and Wolter (2016) concentrated on another dimension of collocational processing. They included semantic opaqueness variable into their analysis. In other words, they investigated the possible difference in the participants' response times to collocations (semi-transparent lexical combinations) and free combinations (fully transparent lexical combinations). They concluded that semi-opaque word combinations cause a processing burden when compared with fully opaque combinations for both native and non-native language users. Therefore, they stated that both semantic transparency and collocational frequency play a role in the processing of collocations. Wolter and Yamashita (2017) involved a wide range of variables in their analysis. They took word frequency as well as collocational frequency, congruence in L1 and proficiency in L2 into account as important indicators of collocational processing. They found out that English non-native participants seemed to process congruent collocations faster than incongruent ones. All the groups of participants (i.e. native English, intermediate and advanced L2 English language users) were sensitive towards not only word level frequency but also collocational frequency. In an attempt to explain the congruence effect, they referred to age and order of acquisition influence. They further claimed that their results contradict with

Wray's (2002, 2008) remarks in that native and non-native language users in their study processed formulaic expressions in a similar manner. Wray (2002) asserts that collocations are processed differently by non-native speakers compared with the processing of collocations by native speakers. In her own famous example, 'major catastrophe', while native speakers take and internalize it as it is to talk about a big disaster, non-native speakers tend to decompose the lexical unit into its single parts and store it separately and when the need it be, they retrieve them separately and recompose the chunk again, which is likely to result in a difference in the processing times. Durrant and Schmitt (2009) investigated the possible difference in the use of formulaic expressions by native and non-native language users. Claiming that they were covering the shortcomings of previous research, one of the major components of which is frequency measures, they concluded that non-native speakers tend to employ highly frequent collocations and underuse many less frequent and semantically associated lexical combinations although they can be considered salient for native speakers. In another study questioning the psychological reality of collocations, Durrant and Doherty (2010) conducted a collocational priming experiment attempting to validate Hoey's (2005) theory. Their findings indicated that collocational priming exists only for those collocations, members of which also have semantic associations. Therefore, they stated in the discussion part that the models proposed so far with regard to the processing and representation of collocations in the mental lexicon need elaborating. On the whole, it can be observed that the issue of formulaic language processing and collocations in particular, has been investigated from many different aspects and variables, such as target word frequency, collocational frequency, proficiency level, vocabulary size, and congruence have been scrutinized in the studies discussed above.

From a broader perspective, one can observe that vocabulary acquisition research has gained importance mainly due to the growing trend in pragmatics. Researchers and linguists started to classify the study of language as language structure and language use. Research in linguistics and applied linguistics focused more on the latter since the principal aim of language has been regarded as communication (i.e. pragmatic competence). As a result, vocabulary that is an important aspect of pragmatic competence has been given more importance. Following this trend, language specialists and applied linguists have made many proposals for lexical syllabuses. Furthermore, the advent of large size corpora accelerated the vocabulary acquisition research. With the help of corpora (e.g. Corpus of Contemporary American English - COCA and British National Corpus - BNC as representative corpora), many words and lexical units have been explored thoroughly and objectively. Rather than concentrating on single lexical items, researchers doing language acquisition, learning or education studies in particular attempted to investigate multiword units, such as collocations since it has been widely accepted that in order for a second or foreign language learner to be fluent in language use, he/she needs to master pre-fabricated phrases like collocations. Second language acquisition research has paid great attention on the significance of multiword units (e.g. Wray, 2002). Research conducted as early as 1970s (e.g. Fillmore, 1976) documented extensive formulaic language use by L2 users. Models of L2 lexical knowledge and second language acquisition have also underlined the status of multiword units (e.g. Nation, 2001). To illustrate, language acquisition is mainly regarded as sequence learning in usage-based models of language acquisition. It starts from phonological strings in words and continues with a probabilistic order of chunks or collocations. It is after these sequences of lexical co-occurrences that syntactic and semantic organization emerge (Ellis, 1996). As also discussed above, Wray (2002) claims L2 users rely more on the meanings of the individual items of a collocation while processing them as opposed to native speakers who process multi word units as they are (i.e. as a chunk). There are some other research studies (e.g. Durrant and Schmitt, 2010) disagreeing with Wray’s belief and stating that the difference between the processing of formulaic phrases, collocations in particular seem to stem from the low exposure time of L2 users to the L2 input and formulaic language rather than a non-native attitude to language learning. They performed an experiment with advanced level non-natives in an ESL setting. In an attempt to make sure that they had no previous knowledge of the lexical items in the research, participants were instructed to read aloud some of sentences which contain made-up, low-frequency, adjective-noun collocations. After that, they were given a timed cued recall task with guidelines to recall word combinations from the preliminary phase. The findings indicated that second language learners remember the collocations they encounter even after a single experience. Other studies by Wolter and Gyllstad (2011) and Siyanova-Chanturia and Spina (2015) also assert and validate earlier research that as L2 users get more advanced in the target language, they seem to be more sensitive towards frequency and their findings state that advanced L2 users tend to process formulaic sequences as chunks depending on their frequency. The difference in the processing of collocations could also stem from exposure time in a native language setting, the frequency of L2 use, and thus the amount and/or the quality of the input (Durrant and Schmitt, 2010).

Looking at the issue of exposure and language input from a first language acquisition perspective initially, it has been accepted by many researchers that children employ memorized phrases that they are exposed to in everyday language in early language production. Encountering an unknown pattern, children tend to grasp and recall the most salient pieces, which are fixed expressions in general that are common in L1 input. They seem to conduct this strategy in order to handle the processing burden. It is also claimed by some researchers that these multiword expressions play an important role in the development of a more advanced language production. In other words, child language becomes creative by means of regular investigation of patterns they are exposed to which are in the form of fixed expressions (Tomasello, 2003). Usage-based construction grammar puts formula-based language learning into the centre of its perspective as opposed to the Chomskyan (1956) view with a nativist perspective. As is discussed in the previous sections, usage-based models see language acquisition as a cognitive process which is a similar process to other non-linguistic processes in contrast to the nativist approach seeing language acquisition as a separate faculty of the cognitive system.

Approaching the discussion from a different angle, one might also argue that formula-based approach to first language acquisition and the effect of frequency of use on processing the language may be true for second language acquisition as well. On the whole, based on the earlier assertions it can be claimed that second language learners exploiting or being exposed to formulas for some time may be able produce native-like utterances (Lewis, 1993). However, some researchers approach the issue more tentatively and state that second language acquisition could be a more complicated process than this and it may not imitate the first language acquisition experience (Ellis, 2003; Wray, 2000). There are some reasons for considering that formulaic language has a different role in adult second language learning taking into account the assumptions of its role in first language acquisition. For one thing, second language learners are cognitively more advantageous since they experience a language learning period (i.e. their native language). While first language learners develop their language knowledge hand in hand with other types of knowledge, second language learners rely on their pre-existing conceptualisations. Secondly, second language learners use their analytical skills which infant L1 learners lack. As Ellis (2003) states mature second language learners possess advanced methods of thinking and are inclined to see language acquisition as an explicit learning process. Cultural conventions and classroom applications tend to promote explicit scrutiny of the input (Wray, 2002). Ellis (2003) suggests that second language learners have pre-existing constructions from their L1, which could help them during the acquisition process or hinder the process as some categories may not overlap and second language learners may need to reconstruct those concepts by overwriting or replacing the pre-existing and inconsistent representations in their L1. The nature of the language input is also something that needs to be emphasized. First language learners are exposed to the language in its natural setting where they can develop their language by scaffolding and discovering the dynamics implicitly, whereas second language learners use the language in a classroom setting in which exposure patterns are not likely to reflect real-life situations and formulaic language use is lacking (Ellis, 2003).

Another important dichotomy that can emerge from this discussion is the difference between being exposed to L2 in its natural setting and using the language in a non-native setting and its potential effect on collocational processing, which is of importance for the current research as the participants taking part in Expriment 2 and 3 live in two different settings; the UK and Turkey and they are assumed to have different language exposure experiences and tendencies. It is widely accepted that the context in which the language user acquires or is exposed to the language tends to make a big difference (Lewis, 1993). The participants of the third experiment who are Turkish native postgraduates at a UK university and acquiring English in an ESL context are good examples of those who have an intensive native language input and are exposed to language full of collocations and fixed expresssions. In addition to getting formal education in second language learning classes, they are exposed to the target language in their daily life. They need to fulfil their daily activities and use the language to survive, so they have a considerably stronger motivation to acquire the language. They are exposed to the language even when they are not aware, which is referred as peripheral learning in the literature (Lozanov, 1978). In addition, they have to use pre-fabricated phrases more than the participants of the second experiment in Turkey since they need to sound more natural and be more fluent during a conversation with a native English speaker to be understood, and what they hear in exchange is full of pre-fabricated phrases, which is likely to have an influence on their acquisition and the lexical processing in the internal lexicon. Therefore, it is claimed that the processing of pre-fabricated chunks and collocations in particular in their mental lexicons could be different for these two groups of people who are regarded as bilinguals in the current study and needs investigating.

Following all the explanations and empirical evidence provided so far regarding collocations and factors affecting collocational and formulaic language processing, Section 2.6.4. addresses the importance of collocations and formulaic language from a cognitive perspective and discusses why collocations ought to be explored further.

2.6.5. Importance of Collocations and Formulaic Language for L1 and L2 Processing and Production

It is asserted that native speakers’ use of formulaic expressions can be partially encouraged by the fact that processing of prefabricated chunks are cognitively less demanding and native language speakers are inclined to use the language effectively. In other words, they avoid forming new structures from scratch to cope with the cognitive burden of the real-time language production and comprehension while paying attention to fluency at the same time (Kuiper, 2004). Logan’s instance theory (1988) suggests that a person learning a new skill (e.g. language) exploits the algorithm first. After each performance, memories accumulate and the pile of memories help retrieve information to carry out the action faster. In the end, it evolves into a phase in which retrieval of the memorized information is faster than performing the action by applying the rules from scratch, which is called the automatization stage. Logan’s model is in line with the idea that formulaic expressions are essential for fluent language production in that retrieval of earlier linguistic knowledge may incorporate formulas, which help produce the language faster. Ellis (2001) asserts that chunking appears to contribute to the automatization of practised skills and that formulaic language may be seen as an important component of the same principle. As is stated, it is cognitively less demanding to employ prefabricated phrases or formulaic expressions in language production. To make an analogy, numbers could be given as an example. People tend to memorize numbers in groups for cognitive reasons (e.g. 378-523-912) in an attempt to use the storage of short term memory efficiently and because it is easier to recall and it helps decrease the processing burden. The same logic works for strings of letters (chunks) or strings of words (collocations) for the sake of processing efficiency and to put less pressure on the short-term memory, which has a deep influence on fluency in language production as the processing durations go down (Ellis, 2001).

As is discussed in the earlier sections, formulaic expressions are regarded as unanalysed chunks of language employed in particular social instances

(Nattinger and DeCarrico, 1992). These fixed expressions play an important role in language production because they are inevitable components of fluent speaking. More importantly, they tend to form the basis of novel sequences, which are also likely to be stored as new chunks in the mental lexicon (Schmitt, 2010). A primary advantage of using formulaic language is the fact that it facilitates processing and enhances fluency, which eventually helps the language user focus on other communicative acts rather than forming new word combinations or lexical bundles from scratch that are already prefabricated in their lexicon and are ready to use. Nation (2001) also supports the view that chunks ease the language users' burden during lexical processing. It must also be noted that chunking takes place at different levels, such as morphemic and collocational levels. Jiang and Nekrasova (2007) claim that both L1 and L2 language users appear to respond to formulaic expressions considerably faster than non-formulaic expressions. They conclude that faster reaction times and fewer errors could also indicate that not only native speakers but also L2 users appear to benefit from formulaic expressions in language production and that formulaic language should be at the centre of second language teaching. Cognitive approach to language learning favours chunk-based and memorized language acquisition, whereas the Structuralist view supports rule-governed language learning. It is claimed by many studies though that (e.g. Tomasello, 2000) children acquire their native language by exploiting chunks like 'collocations' and creating new phrases based on the ready-made constructions. They seem to discover the grammar rules inductively by generalizing the patterns observed in the constructions (Tomasello, 2003).

Usage-based models posit that first language acquisition is an inductive process. To be more precise, the mental grammar of the language users seems to be constructed by means of discovering the patterns of language use from the context. Acquiring collocations is likely to be a part of this inductive process and that they play an important role in first language acquisition as well as second language learning. One of the reasons why studies investigating collocations are intriguing is the fact that they are likely to elucidate how language is processed and how two or more languages interact in the mind. This can be regarded as an extension of the Firthian trend, which lacked conclusions regarding the psycholinguistic aspect of languages. As Ellis (2001) and Hoey (2005) state chunking or priming ought to be employed for a psycholinguistic explanation of collocations. This aspect of collocations has a lot to say about first and second language acquisition (Tomasello, 2003), language processing (Ellis, 2001), and new approaches to second or foreign language teaching (Nattinger and DeCarrico, 1992). Studies conducted so far which investigate collocational processing have focused particularly on English and morphologically similar languages. However, little research has attempted to explore the case in typologically different languages. Based on his research on typological universals, Greenberg (1974) classified languages according to their subject, verb and object order in sentences. He states that the languages in the world can be divided into two large sets; Subject + Verb + Object (e.g. English) and Subject + Object +Verb (e.g. Turkish). Considering the main assumptions of this research, different word order in Turkish and English is likely to make a difference in the processing times of collocations in a cross-linguistic collocational priming experiment. To be more precise, adjective+noun combinations are in the same order both in English and Turkish, but although verb+noun order is valid for English, just the opposite is true for Turkish (i.e. noun+verb) as in ‘make a decision / karar ver-’. However, an alternative assumption could be that advanced L2 users do not translate the single lexical items in a collocation or a formulaic expression as they may be processed in chunks even when they are presented cross-linguistically and word order won’t affect the processing times after all. It must be underlined as a result that the issue of collocational processing should be discussed further by taking into account the typologically different languages which are underrepresented in the lexical processing and formulaic language literature.

Some studies (e.g. De Cock et al., 1998) exploring the difference between the use of formulaic expressions by L1 and L2 users concluded that L2 users with an advanced level tended to employ more formulaic expressions in their spoken production, which could be attributed to the Idiom Principle (Sinclair, 1991). However, it should be noted that the formulaic expressions exploited by L2 users are not necessarily identical with those of native speakers', as they are not employed with the same frequency and they appear to have distinct syntactic realizations as well as different pragmatic functions. As opposed to focus of by De Cock et al. (1998), Granger (1998) concentrated on the written production of the L2 users. She investigated the use of collocations and formulae separately using her own corpus compilation together with the Louvain Essay Corpus, International Corpus of English and the Lancaster-Oslo-Bergen Corpus. The findings indicated that L2 users seemed to use fewer prefabs than L2 users and the collocations exploited by L2 users were mainly congruent ones with the L1 counterparts. The results of De Cock et al. and Granger's studies appear to be contradictory because they scrutinized different types of lexical items and the type of the corpus exploited was not the same although they both had a frequency-based perspective. Although only two studies are presented here, they suffice to summarize and represent the controversy regarding the use and processing of formulaic language by L1 and L2 users in the literature. Furthermore, the variations in research methodologies also seem to differ, which results in contradictory findings. Taking into account these disagreements in the literature, one can deduce that formulaic language use by L1 and L2 speakers needs to be investigated further and studies on collocational processing have the potential to shed light on these unexplored or underexplored issues. The discussion so far has centred on research exploring the use of collocations and formulaic language by L1 and L2 users, learning collocations, collocational processing, and the importance to investigate collocations on the whole. Another critical issue and key terminology for the current research is the psychological reality of collocations. Section 2.6.5 will briefly address the theory of lexical priming by Hoey (2005) before expounding upon cross-linguistic approaches to lexical processing and identifying the niche in the literature which the current study seeks to occupy.

2.6.6. Lexical & Collocational Priming

As Firth (1957) suggests, you shall know a word by the company it keeps. Building on the Firthian tradition, Hoey (2005) puts forward a new theory of lexical priming saying every word is mentally primed for collocational use. He further states that collocational priming is sensitive to the contexts (textual, generic, and social) in which the lexical item is encountered, and it is part of our knowledge of a lexical item that is used in certain combinations in certain kinds of text. He describes collocation as:

> "a psychological association between words" which is "evidenced by their occurrence together in a corpus more frequently than is rational in terms of random distribution" (2005, pp. 3-5)

According to this model, psychological association is measurable in terms of the psycholinguistic notion of 'priming'. Hoey argues that priming is also the basis of our creative language system. In his view, the grammatical categories assigned to words are not determined by an independently existing grammar. Rather, they emerge from lexically specific patterns of priming. This view has a lot in common with the usage-based models, which are closely in line with Cognitive Linguistics and Construction Grammar (Barlow and Kemmer, 2000). The constructivist and cognitive view of language posit that language learning stems from overall practices of human inductive reasoning being applied to the specific problem of language. As opposed to the Cartesian view of linguistics, constructivists and cognitive linguists believe there is no language acquisition device specifiable in terms of linguistic universals, principles and parameters, or language-specific learning mechanisms. On the contrary, language has a lot in common with other cognitive processes, but its cognitive content can be distinctive. Furthermore, genes are not the mere source of the language, but it can be stated that learner's language mainly comes from the structure of adult language as well as the structure of social and cognitive skills (Ellis, 2001).

With his approach, Hoey (2005) partially disagrees with Generative Grammar (Chomsky, 1956) and takes the issue into account from a psycholinguistics or cognitive linguistics perspective. The Chomskyan view of language asserts that the chief aim of linguistics is to explore speakers’ competence (i.e. the abstract system of linguistic knowledge) rather than linguistic performance. Chomsky states that he is concerned with internalized (i-) language – the abstract linguistic system in the speakers’ minds – not the externalized (e-) language. On the other hand, Hoey (1991, 2005) and Sinclair’s (1991) studies primarily focus on the investigation of e-language supported by corpora. Sinclair further believes that exploring competence and ignoring real life language performance for the sake of avoiding the possible chaos in the language use is meaningless considering the power of large-scale corpora (1991, p. 103). In addition to his claims about the priming of string of words and associations of phrases (2005, p. 11), Hoey suggests that words are primed to occur with particular grammatical patterns; or as Sinclair puts it, “lexis and syntax are co-selected” (2005, p. 40). Three different versions of co-selection are observed according to him; a) certain words or word clusters are primed to co-occur with/avoid specific grammatical functions, which is in line with Sinclair’s idea of colligations [e.g. ‘that winter’ is primed to occur with past tense verbs (2005, p. 39)], b) words/phrases are primed to occur in/avoid certain grammatical functions [e.g. the word ‘consequence’ is primed to occur as part of an adjunct or complement (2005, p. 46)], c) words/phrases are primed to occur in/avoid particular sentence positions, which is why the word ‘consequence’ is primed to occur in theme position (2005, p. 49-52).

Taking a step further, Hoey claims that there is priming for certain textual relations and he touches upon the issue of discourse, which Sinclair lacks in his assertions. He presents his claims in three main points. First, he says words or group of words are primed to occur or not to appear in certain types of cohesive relations, which can be seen as a tendency named ‘textual collocation’ in his own words. He tries to exemplify this issue by giving the word ‘army’, more than three quarter of whose occurrences is part of a cohesive relation in his corpus. Some other words, however, like ‘blink’ are detected to avoid such cohesive chains (2005, p. 119). Second, words or groups of words are primed to occur or not to appear in certain semantic or pragmatic relations, such as problem-solution, cause-effect, compare-contrast and so forth. For instance, a big proportion of the instances of the word ‘ago’ in his newspaper corpus were found to occur in contrast relations when it is part of a Theme (2005, p. 123). With regard to his final textual claim, words or groups of words are positively or negatively primed to occur at the beginning or at the end of an independently identifiable chunk of text. To give an example, the word ‘reason’ with the meaning of rationality/logic has positive priming for sentence ending. Approximately a quarter of the instances appear as the last words of the sentences (Hoey, 2005, pp. 129-130). Overall, Hoey is of the opinion that all these priming forms accumulate as we are exposed to the language in our environment. Priming can partially be considered individual as every language user has a different language learning experience. The ‘drifts’ as he calls, are likely to be adjusted over time since particular set and harmonizing standards need to be present in order for every language user to understand each other, which means priming occurrences do not vary extensively (2005, p. 9). These standards consist of education, literary and religious traditions, the mass media, and reference works, such as dictionaries and grammars (2005, pp. 181-182).

Hoey also acknowledges the fact that there may be some ‘cracks’ (i.e. conflicts) in priming. A prime illustration of this fact can be seen in intentionally learned rules being inconsistent with intuitively acquired primings. This can even put you in a situation where you cannot decide which word or form to use in a specific context (2005, pp. 178-180). To be more precise, the cases of ‘me and you’ and ‘me and X’ seem to contradict with the priming tendency of the pronoun. For most English speakers, the pronoun ‘I’ is strongly primed to appear at the beginning of a sentence in the subject position and the pronoun ‘me’ tends to avoid that position (2005, pp. 178-180). It must also be noted here that based on Hoey’s remarks, priming seems to be genre-specific, i.e. it appears to consider the speakers addressing each other (e.g. friends, professor-student) and the subject of the speech or writing (2005, p. 13). Native language users tend to surmount these ‘cracks’ in their primings by using their native language intuition (2005, p. 179). To exemplify a similar case in Turkish, what grammar books explain about the use of ‘neither .... nor ...’ (*ne.....ne de....*) and what first language users actually perform in their speech appear to contradict. The negative structure of the phrase encourages native speakers to employ a negative ending intuitively. For instance, native speakers are primed to say (*Ne arkadaşları ne de ailesi onu desteklemedi)* “Neither his friends nor his family did not support him” rather than correct form according to prescriptive grammars, (*Ne arkadaşları ne de ailesi onu destekledi)* “Neither his friends nor his family supported him”.

With regard to some research which was discussed earlier, taking lexical priming as their core agenda and employing response time tasks in an attempt to test the language non-specific paradigm, it can be detected that their main focus was either on single lexical units, which are mainly semantically related ones or they investigated typologically similar languages (e.g. Durrant and Doherty, 2010). Researchers who are interested in bilingual lexical processing approached the issue from a cross-linguistic perspective. Their trials lead certain questions to raise and this study aims to fill in one of those niches. Section 2.6.6. will try to summarize some of the studies exploring lexical priming from a cross-linguistic standpoint.

2.6.7. Cross-linguistic Lexical Priming

Cross-linguistic priming on the whole relates to the effect of one language on the processing of another language and it can be observed in bilinguals and multilinguals. What intrigues researchers could be the fact that it may give some hints regarding the psycholinguistic nature of lexical units and help understand the internal structure of the bilingual mental lexicon. Research exploring cross-linguistic priming exploits not only psycholinguistic techniques but also makes use of corpus approaches and these studies have the potential to shed light on the cognitive process of second language acquisition, resolve the language specific and language non-specific lexical activation dilemma and illustrate the organization of the bilingual mental lexicon (Jiang, 2012). Looking at the history of research exploiting response time which is also the basis for cross-linguistic priming studies, one can observe that word association and free recall studies were more common than response time research in 1980s mainly due to the technological limitations. However, as the technology improved, researchers started to rely more on response time applications while examining bilingual performance. The two main issues investigated by researchers in the 1980s were whether bilinguals possess a single or two separate mental dictionaries and if these lexical systems interact at the lexical or conceptual level. With regard to lexical activation, the basic question was if bilinguals are capable of activating one of their languages selectively; that is to say, if they are able to produce utterances in one language while their second or third languages are inactive.

Psycholinguistic research studies have commonly employed the cross-language priming experimental paradigm in order to investigate bilingual lexical representation and organization and test the language non-specific paradigm. In this model, semantically related and translation equivalent cross-language word pairs are shown to subjects successively and researchers ask participants to provide a timed response through lexical decision or word naming tasks. The method explores whether bilinguals reflect response time differences to pairs of prime-target words differing in their semantic relatedness. If the subjects respond faster to related pairs across languages, it could be explained by the facilitation, which results from the implicit spreading activation from the prime word to the target word in bilinguals' mental dictionary. The findings so far seem to indicate that the bilinguals' two mental lexicons share a common conceptual memory representation (Pavlenko, 2009). In most cross-language priming studies, researchers have concluded that one can observe translation and semantic priming effects across languages. They have also detected many patterns, one of which suggests that cross-linguistic priming for translation equivalent words is observed more often than semantically related words (Altarriba and Basnight-Brown, 2007). Another pattern witnessed was that priming effects in the L1-L2 direction were much stronger than those in the L2-L1 direction, which is regarded as ‘priming asymmetry’ (Jiang and Foster, 2001). With regard to some details of these studies, Altarriba (1992) detected priming effects in the translation of the native language to the second language. The SOA (stimulus onset asynchrony)[13] of the strategic priming was 200 ms. A similar pattern was discovered in a study by Keatley, Spinks, and de Gelder (1994) only from the native language to the second language for associative prime–target pairs, whose subjects were Chinese–English and French–Dutch bilinguals. The same trend was observed when the masked priming paradigm was employed in the methodology. Translation priming effects in the L1-L2 direction were found in a study whose participants were Hebrew–English bilinguals for both cognates and non-cognates by Gollan, Forster, and Frost (1997). The same pattern could not be observed in the L2–L1 priming direction. Similarly, Jiang (1999) concluded that there seemed to be significant translation priming in the L1–L2 priming direction but priming in the opposite direction (L2–L1) was almost none. The results of many research studies are also consistent with the findings of the studies reported above in that priming effect in L1-L2 direction is dominant (e.g. de Groot and Nas 1991).

Many variables and methods have been exploited in cross-linguistic priming research. Some of them were cognates vs. non-cognates, abstract vs. concrete words, translation equivalents, semantically related words, and some tasks were word naming and lexical decision. To exemplify, Jin (1990) used both concrete and abstract words in a cross-linguistic priming experiment and a strong priming effect for only the concrete words was observed. Likewise, in some studies, it was concluded that bilinguals appeared to respond faster during translation equivalent tasks when subjects were exposed to concrete words and cognates rather than abstract and non-cognates (e.g. de Groot, 1992b; Van Hell and de Groot, 1998). In another study by de Groot and Nas (1991) a masked priming method was used and it was discovered that there was cross-linguistic semantic priming for cognates. In a similar vein, a strong

[13] It is the interval between the onset of one stimulus (i.e. prime) and the onset of another (i.e. target) within the same trial.

priming effect and a faster response time in translation equivalent tasks for cognates were detected in some other studies (e.g. Sa´nchez-Casas et al., 1992). Another issue scrutinized was the direction of priming. de Groot and Nas (1991) exploited cognate status and prime and target word relation as well as manipulating masking and priming direction. They concluded that there was translation-priming effect in L1-L2 priming direction in a masked priming experiment. The effect was considerably stronger for cognates than non-cognates. Another finding was semantic priming of cognates rather than non-cognates. In another study with a similar approach, Sa´nchez-Casas et al. (1992) made a comparison between translation priming effect for cognates and non-cognates in a semantic classification task. The task of the subjects was to decide if a target word fit into the class displayed previously. They used masked priming and the prime words were in second language for most participants. The findings indicated a significant masked L2-L1 translation priming for cognates. On the other hand, a priming effect in the L1-L2 direction was detected in a study by Gollan, Forster and Frost (1997), whose participants were Hebrew-English bilinguals. Although they found priming for both cognates and non-cognates, the effect was remarkably stronger for cognate items. More recent replications of the previously discussed research are also available. To exemplify, Kim and Davis (2003) found translation priming for non-cognates in the L1-L2 direction in a lexical decision task. However, Finkbeiner et al. (2004) detected an L2-L1 translation priming with a semantic categorization task. Jiang and Forster (2001) employed the same methodology and came up with the same priming asymmetry in a lexical decision task.

The findings of the recently summarized research studies seem to contradict each other in part. Many studies claimed there was bi-directional priming in translation equivalent words, cognates and non-cognates with differing response times, though. Some found priming effect only in L2-L1 direction, whereas others suggested a priming effect in the other direction, which is named as priming asymmetry. It must be noted, however, that these research studies employed slightly different methodologies or their sampling was partly different from each other. To illustrate, the subjects of the Basnight-Brown and Altarriba’s (2007) study were advanced L2 users. They were reported to have learnt English at a very young age and could be regarded as early or balanced bilinguals. Furthermore, there were some alterations in the way stimuli were presented to the participants. For instance, Basnight-Brown and Altarriba (2007) used 100 milliseconds SOA during the presentation of the prime rather than the widely accepted 50 milliseconds, claiming that 50 milliseconds is not enough time to affect automatic lexical processing. One limitation of the study was the fact that they didn’t ask the participants at the end of the experiment if they were able to identify the primes, which is why the current study includes a follow-up procedure to be conducted after the priming experiment to make sure that participants don’t see the prime words consciously or at least they couldn’t understand the relationship between the words and that the priming effect is automatic.

Two recent studies have been conducted to explore the effect of L1 on collocational processing in L2 and the explanation put forth both by Carrol and Conklin (2015) in respect to idioms and Wolter and Gyllstad (2011) was the automatic L2-L1 priming. According to their research findings, the L2 word automatically primes its L1 translation equivalent, a phenomenon well documented by previous research. Following that priming impact, the L1 word, in turn, appears to prime its L1 collocates which results in a faster recognition of the congruent collocation in the L2. Whether it is the case for every word pair with different parts of speech or if there is a difference in terms of typologically different languages has not been investigated thoroughly. As is seen in the recently summarized research, there is variety of research investigating the cross-linguistic lexical priming in bilinguals. However, few research studies, to the writer’s knowledge, have attempted to explore if cross-language collocational priming exists in the bilingual (L1 Turkish and L2 English) mental lexicon. With this notion in mind, the current study having a language non-specific lexical access perspective aims to shed light on the interaction between the collocations across languages in the bilingual mental dictionary.

The sections up to this part have concentrated on the key terminology; bilingualism, mental lexicon, formulaic language, collocations, lexical priming and cross-linguistic lexical priming in addition to expounding upon research investigating the processing of formulaic language and collocations. The following lines in Chapter 3 will address the main focus and the rationale of the current research study as well as its methodological considerations.

CHAPTER 3
METHODOLOGY

3.1. INTRODUCTION

The primary aim of this study on the whole is to question the psychological reality of collocations in the bilingual brain and the contributing factors to the processing of frequent word combinations cross-linguistically with the help of carefully designed priming experiments. The results are discussed within the scope of the mental lexicon frameworks, Spreading Activation Model (Collins and Loftus, 1975) and Modified Hierarchical Model (Pavlenko, 2009). Furthermore, considering the developmental nature of vocabulary knowledge and the effect of frequency of language use, the results were discussed by referring to the model proposed by Jiang (2000) titled Lexical Representation and Development in L2.

As Saussure (1916) suggested, language is formed of linguistic signs (i.e. signifier and signified), functions and meanings. Cognitive Linguistics sees these form-meaning mappings as constructions. These units are accepted by the speech community and they are entrenched in the language learners' minds. Morphological, syntactic and lexical form features are integrated with semantic, pragmatic and discourse functions with the help of these constructions (Barlow and Kemmer, 2000; Tomasello, 2003). Corpus Linguistics approaches the issue from a statistical perspective and explores co-occurrences of lexical items and their frequencies. Psycholinguistics depicts language users' sensitivity to these frequencies and provides evidence to language acquisition research based on usage-based theories (Ellis, 2002a). The convergence between the key findings of cognitive linguistics and the results of neo-Firthian corpus linguistics incorporates and enlightens psycholinguistics, whose exploration of language processing has indicated the importance of co-occurrence among words. This is in line with the neo-Firthian idea emphasizing how important collocations are. Considering all these aspects of interrelatedness of the fields mentioned above, the current research was built on Hoey's (2005) 'Lexical Priming Theory' which has many commonalities with the emergentist approaches of language, made use of corpus data for item development on the grounds that corpus data need to be utilized as a validation on the naturalness of the language task that the experiment sets for its participants. Finally, an online psycholinguistic method, lexical priming (with a lexical decision task), was employed in an attempt to find proof for priming in Turkish and cross-linguistic collocational priming in the L1 Turkish-L2 English bilingual mental lexicon. As McEnery and Hardie (2011) state merging the methods and findings of corpus linguistics, functionalist theoretical linguistics and experimental psycholinguistics seems to be an effective approach for a comprehensive and an evidence-based model of the nature of language.

In the light of the statements above, the current research can be regarded as a mixed approach example which is trending and gaining importance in recent years. Section 3.2. first provides a summary of the planned experiments in combination with the rationale explaining how the research questions and the planned experiments relate to one another. After that, it tries to clarify the steps followed before, during and after the experiments and eventually attempts to give a thorough explanation of the sampling, data collection and analysis procedures.

3.2. PLANNED EXPERIMENTS AND THE RATIONALE

Three different priming experiments were conducted to investigate (a) the existence of collocational priming in Turkish, (b) if cross-linguistic collocational priming exists in L1 Turkish-L2 English bilingual mental lexicon, (c) the factors affecting collocational processing and (d) whether there is a relationship between frequency of language use (or language exposure) and collocational priming.

The starting point for the research was to investigate the existence of cross-linguistic collocational priming in the bilingual mental lexicon (L1 Turkish-L2 English) and the contributing factors to the processing of collocations cross-linguistically. What intrigued the researcher in the first place was earlier empirical evidence indicating collocational priming in English and the lack of proof of its existence in a typologically different language. With this notion and aim in mind, it was thought that an investigation of collocational priming in Turkish initially would be a rational preliminary step to set a baseline for the cross-linguistic experiment. The existence of collocational priming in Turkish in the bilingual mental lexicon and the possible influence of collocational frequency in the process could make the cross-linguistic investigation a more logical second step.

To this end, 28 L1 Turkish-L2 English bilinguals took the first experiment, which was a lexical decision task including Turkish only collocations (N+V[14] – ADJ+V) and exploring the existence of collocational priming in Turkish. The first experiment was designed to answer the first two research questions:

1. To what extent does collocational priming, if any, exist in Turkish?
2. Does item frequency play a role in collocational priming in Turkish?

Since a significant priming effect was detected in the first experiment and significant negative correlations were found between the mean response times and collocational frequency values, the second experiment, which explores cross-linguistic collocational priming with lexical items either in L1-L2 or L2-L1 direction, was conducted with 30 separate participants, who were L1 Turkish-L2 English bilinguals located in Turkey. The second experiment including congruent and incongruent collocations with two different POS groups (i.e. ADJ+N – V+N) was aiming to answer the research questions three, four and five:

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[14] Although the regular order is N(oun)+V(erb) in Turkish, the presentation in the first priming experiment was in V(erb)+N(oun) combinations since the first experiment was the preliminary step of the second and third cross-linguistic collocational priming experiments. The writer wanted to make sure the data were comparable and the output of the experiments complemented one another.

3. Is it possible to state that symmetric and asymmetric cross-linguistic collocational priming exists in the bilingual mental lexicon?
4. Do the syntactic-order based differences of English and Turkish influence bidirectional collocational priming?
5. To what extent does (a) collocational frequency (b) the relationship between congruent vs. non-congruent L1 and L2 collocations, if any, play a role in the bidirectional activation of L1 and L2 collocations?

Having found traces of collocational priming in Turkish and cross-linguistic collocational priming in the bilingual mental lexicon as well as some relations between the mean response times and the variables, such as frequency, congruence and word order with the help of Experiment 1 and 2, the researcher sought to look into a possible relationship between language exposure and cross-linguistic collocational priming. It was assumed that the environment in which you are exposed to the language as well the frequency of collocational use could influence how you process collocations cross-linguistically. To address this issue, a third cross-linguistic collocational priming experiment including the same collocational items exploited in the second experiment was conducted in the UK setting with thirteen L1 Turkish-L2 English bilinguals. The third experiment aimed at answering the last research question:

6) Is there a relationship between the type of L2 exposure and collocational priming?

3.3. PRE-EXPERIMENT DATA COLLECTION

To address the research questions, three different sampling groups to take part in three different experiments (Experiment 1: Collocational Priming in Turkish, Experiment 2: Cross-linguistic Collocational Priming in L1 Turkish-L2 English bilingual mental lexicon in the Turkish setting, Experiment 3: Cross-linguistic Collocational Priming in L1 Turkish-L2 English bilingual mental lexicon in the UK setting) were formed. Non-probabilty sampling was employed in this study and the researcher acknowledges the fact this sampling method is problematic in terms of achieving population validity. More specifically, the study used a purposive sampling and also it can be stated that the exploited sampling method was homogeneous as the researcher attempted to make sure that there were a minimum language proficiency difference among the participants in each experiment with the help of certain tests like vocabulary size and considering the fact that they passed certain language proficiency standards (e.g. national exams, recruitment exams of state universities), though personal differences regarding language learning and exposure differences were also reported. The researcher contacted certain number of participants for each experiment and those who were willing to attend sit the vocabulary size test, took the LHQ and digit span tests, and as the researcher made sure that they were above a certain level in terms of vocabulary knowledge, which is claimed to correlate with language proficiency to a certain extent, they were chosen for the related experiment. The above-mentioned instruments were exploited to choose eligible (i.e. as homogenous as possible) participants for each experimental setting and the results of these tools were used merely for sampling purposes and the output was not exploited to answer the research questions. As is discussed more comprehensively in Section 2.2., this study adopts individual bilingualism and the participants of each experiment in this study are regarded as late (i.e. unbalanced) L1 Turkish-L2 English bilinguals. Section 3.3.1. provides an overall descriptive information regarding the exploited instruments before giving the participant details of each priming experiment.

3.3.1. Instruments

3.3.1.1. Personal Information and Language History Questionnaire (LHQ) 2.0

Before the second and third priming experiments only, the participants were asked to fill in the LHQ (Li et al., 2006), which was designed by Penn State University, Brain Language and Computation Lab[15] as an open source tool for psycholinguistic or cognitive linguistic research. The questionnaire includes

[15] See the website at http://cls.psu.edu/research/brain-language-and-computation-lab

sections regarding participants' age, gender, educational background, how long they have been exposed to the foreign or second language, if they have lived in a foreign country for a certain period in their life, and official test scores etc. In addition, the participants are asked to rate their overall proficiency as well as in receptive and productive language skills. The open source tool designed by Penn State University helps researchers build their own language history questionnaires based on a template and provides multiple language support. The questionnaire can be applied online or on paper and the results can be downloaded in excel format. It is also possible to delete any result after you finish your application. All the information provided by the participants is confidential. The tool makes sure of confidentiality by giving each participant a unique identification number rather than a name. To be more precise, the participants do not have to give their personal information, such as name, phone number etc. The answers of the participants can only be accessed through a password protected web interface. LHQ 2.0 has multiple sections. In the first part, the researcher gives brief information about the overall aim of the experiment. In the second part, the researcher chooses the type of the questionnaire he is willing to conduct and decides if he wants to use the whole questionnaire or specific parts of it. In the third phase, based on the aims of the experiment, the language of the questionnaire is chosen. Following that, the system provides the researcher with a unique web address and an identification number. The researcher shares this web address with the participants in order for them to respond to the questions. When a participant finishes the questionnaire, the system automatically saves the results as excel documents. The researcher can see the responses any time by using his personal password, can delete certain results or update some questions. A sample questionnaire can be seen in Appendix A.

3.3.1.2. Vocabulary Size Test[16]

The test was used for the participants of the second and third experiments only. It was developed by Nation (2006) in order to provide a reliable, accurate and comprehensive measure of second or foreign language English learners' written receptive vocabulary size from the first 1000 to the fourteenth 1000-word families of English. The words (140) included in the the Vocabulary Size Test are based on fourteen 1000 BNC (British National Corpus) word lists developed by Nation (2006). These lists use the notion of word family as the unit of organization, which has also been empirically proven that the word family is a psychologically real unit (Bertram et al., 2000). Bauer and Nation (1993) state that a word family consists of a base word and all its derived and inflected forms which can be understood by a learner without having to learn each form separately. Therefore, 'arrive', 'arrives', 'arrived', and 'arriving' can all be seen as the members of the same word family. The key principle behind the notion of a word family is that once the base form or the derived version is known, the recognition of the other members of the family entails almost no effort. A multiple-choice format was selected for the test so that a wide range of content can be sampled efficiently, the test can be used with learners from a variety of language backgrounds and control the level of difficulty of the items by testing nearly the same degree of knowledge for each item. It is provided as an open-source material for research purposes and no previous permission is required as long as the test is properly cited. The validity evidence of the test with 140 items was provided by Beglar (2010). According to his calculations, the majority of the items indicated a good fit to the Rasch model (85.6% of the variance), which is a psychometric model for analysing categorical data. Rasch reliability indices were >0.96. One major reason why this test was preferred over others was the fact that it had an online application. The researcher set the test online with a unique ID and shared the unique link with the participants, which made the application much easier. Once the participants finished the test, the results were saved to the system and it was possible to download the scores in excel format, which helped the researcher during the statistical analysis phase.

[16] See the online version at http://my.vocabularysize.com/

The vocabulary size test was employed for a specific purpose instead of a proficiency test in the current study. It was assumed by the researcher that since the priming experiments were focusing on lexical items (i.e. collocations), assessing the vocabulary level of the participants rather than an overall proficiency assessment would be more rational and overlap to a greater extent with the overall aims of the current study. In addition, it is possible to find some research in the literature indicating a positive correlation between proficiency level and vocabulary size test scores. Stæhr (2008) asserts that learners' vocabulary size is strongly correlated with their reading and writing abilities reflected through a national proficiency test in Denmark. Miralpeix and Muñoz (2018) state that vocabulary size appears to account for language proficiency to a great extent, particularly for those students whose vocabulary size was over 5.000 word families[17]. Milton (2010) reports an overall comparison indicating the relationship between receptive vocabulary size scores and CEFR (Common European Framework for Reference for Languages) levels. Furthermore, Meara (1996) claims that learners with larger vocabulary sizes tend to be more proficient in a wide range of language skills when compared with learners with smaller vocabulary sizes. He also asserts that there is evidence to claim that vocabulary skills contribute to all aspects of L2 proficiency. Therefore, the possible comparison between the vocabulary size and language proficiency in the current study will refer to Milton and Meara's remarks. A sample of the exploited vocabulary size test is given in Appendix B.

3.3.1.3. Digit Span Test

Before the actual priming experiments, a digit spat test was used to determine if the participants had a problem with their short-term memory, as the functioning of short-term memory was important for the priming experiments, where the participants were provided with prime words flashed for a short time and were asked to respond to the target words following the prime items. It was assumed that a potential working memory problem could hinder the influence of the prime on the target word. Digit span is a recommended test employed in

[17] Minimum vocabulary size is 9.200 in Experiment 2 and 7100 in Experiment 3.

psycholinguistic oriented studies. It shows the performance of the short-term verbal memory. Scientists consider short-term verbal memory as the cognitive system, which makes keeping and manipulating information in memory for a short time possible. The test was conducted on a computer. The participants saw certain numbers with growing digits every turn on the screen and each time they saw a cluster of number (three digits, four digits, respectively), they had to remember the exact number when the screen turned black and type the number accurately. Representative test items are presented below.

Digit-Span Test

1. 5 9 0
2. 4 8 6 1
3. 7 3 0 9 4
4. 2 4 9 6 5 8
5. 1 4 6 8 2 4 5
6. 3 9 2 1 5 7 6 0
7. 6 2 5 7 3 9 1 8 4
8. 0 6 3 8 9 4 1 7 2 5

The test[18] employed before the priming experiment was developed by Cambridge University Brain Science Lab and released as open-source for research purposes. After researchers open an account, every participant's score has to be saved manually as they finish the test. The interface does not ask for personal details and the researcher gives a subject number to each participant to keep track. As stated earlier, with the help of the instruments explained so far, three different experimental groups with separate subject groups were formed. Participant details and some information about the setting are provided in the following section.

3.3.2. Participant Details and Setting

3.3.2.1. Experiment 1 (Collocational Priming in Turkish)

Twenty-eight native speakers of Turkish, who are regarded as L1 Turkish-L2 English bilinguals, (20 female and 8 male) participated in the Turkish priming experiment voluntarily. Thirteen of them were instructors of English from various universities in Turkey (Hacettepe University, Yıldırım Beyazıt University and

[18] The test can be accessed via http://www.cambridgebrainsciences.com/browse/memory/test/digit-span

Bülent Ecevit University). Their ages range from 28 to 45. Considering that they have passed certain standards, such as the national foreign language test (i.e. YDS or KPDS[19]) and scored at least above 80 over 100 (Mean=92.55) according to the requirements of the Higher Education Council in Turkey to be accepted as an instructor of English at a state university, they are treated as proficient English language users as well as native Turkish speakers.

The other fifteen participants were tertiary level students at Ankara University, School of Foreign Languages, whose ages range from 19 to 20. They passed the English proficiency exam at the end of the fall academic term of 2017 with a score of at least 70 over 100 (Mean=78.5), which is regarded as the benchmark to pass the English preparatory classes at Ankara University, School of Foreign Languages (AUSFL). They are also treated as L1 Turkish-L2 English bilinguals and merged with the lecturer group for the current study as the mean response times of the students and lecturers for the collocate and non-collocate items in the first priming experiment did not reflect a statistically significant difference. In addition, since all the collocational items in the first priming experiment were in Turkish, it was assumed that different proficiency levels in English would not make a significant difference in the results and the interpretations. Due to the reasons provided above, the LHQ including questions about their experiences in English language and vocabulary size test claiming to assess their vocabulary knowledge and overall proficiency in English were not used and this could be seen as a limitation of the first experiment.

All the participants volunteered to take part in the study and filled in the informed consent form before the experiment (see Appendix C for the form). The first priming experiment was conducted with Turkish native participants before the second (i.e. cross-linguistic) priming experiment in order to set the baseline. It was assumed that if priming existed in Turkish, then an investigation of cross-linguistic priming in the bilingual mental lexicon (L1 Turkish-L2 English) would be more rational and the two findings could complement one another.

[19] Official English Language Tests conducted by the Student Selection and Placement Center of Turkey. For further information, see http://www.osym.gov.tr/TR,8860/hakkinda.html

Table 1 shows the details of the participants who took part in the first experiment, which was aiming to look into collocational priming in Turkish in L1 Turkish-L2 English bilingual mental lexicon.

Table 1 – Summary of the Participant Details in Experiment 1

GROUP	Age[a]	Gender (M/F)	Digit Span[b]	Official Test Scores[c]
Experiment 1 *(N=28)*	Mean: 25.5	F 20/71,4%	Mean: 6.9	(13 instructors) YDS Mean: 92.55
		M 8/28,6%		(15 students) AU SFL Proficiency Mean: 78.5

[a] range=19-45
[b] range=6-8
[c] range=85-98 (YDS) / 72-88 (AU SFL Proficiency)

The table shows that the mean age of the participants was 25.5 when the students and the instructors were merged. In terms of gender, female participants outnumbered the male participants, which could be seen as another limitation. Although the researcher reached a group of more than 50 people and asked for their consent for the first experiment, only 28 of them, who were mostly females, responded and volunteered to attend. Finally, it was made sure that the participants of Experiment 1 had a digit span score of at least 6 (i.e. they can hold at least 6 digits of number in their short-term memory and recall them after a few seconds)[20]

3.3.2.2. Experiment 2 (Cross-linguistic Collocational Priming in L1 Turkish-L2 English Bilinguals-TR setting)

Thirty bilinguals with an advanced level of English who are native speakers of Turkish and haven't taken part in the first experiment participated in the second experiment voluntarily. The subjects were instructors of English at AUSFL and some other state universities in Turkey (e.g. Ankara Yıldırım Beyazıt University). State universities in Turkey require certain standards to provide a full-time contract for the instructors of English. For instance, they need to submit

[20] It is claimed that an average adult is believed to have a digit span of 7 items (-/+ 2; Miller, 1956).

an official English language test score proving their proficiency in English with a score of at least 80 over 100. Furthermore, they have to pass the recruitment exams of the state universities as well as attending interviews, which are particularly designed to test their proficiency in English and expertize in the field of language teaching. Therefore, it was assumed that they had similar English proficiency levels. However, some other measures (e.g. vocabulary size) were also taken to make sure they represent the targeted population and the members are as homogenous as possible. Table 2 indicates the summary of the subjects' LHQ, vocabulary size test and digit span test results, who took part in the second experiment.

Table 2 – Summary of the Participant Details in Experiment 2

Age[a]	Gender (M/F)	Education	Digit Span[b]	Vocabulary Size[c]	Self-reported proficiency[d]	Years of target language use[e]	Official Test Scores[f]
Mean: 37.0	F 16/53.3%	BA 9/30%	Mean: 6.5	Mean: 12.440	Mean: 6.0	Mean: 25.2	Mean: 94.68
	M 14/46.7%	MA 12/40%					
		PhD 9/30%					

[a] range=27-55
[b] range=6-8
[c] range=9.200-19.000 [8000-9000 word families are required for reading (Nation, 2006)]
[d] range=5-7 (1: none / 7: native-like)
[e] range=17-40
[f] range=83-99 (YDS or KPDS)

As the numbers illustrate, there were a proportional number of participants in terms of gender in the second experiment (i.e. sixteen female and fourteen male participants). The mean age was 37 and there were participants from different levels of educational background; that is; with undergraduate and postgraduate degrees. The mean score of the participants' vocabulary size tests was 12440, which means they know around 12000 word families on average. As for their official test scores from national foreign language tests, they ranged between 83 and 99 over 100. An additional analysis also revealed that the participants' vocabulary size scores seemed to correlate with their official test scores (*p*=.05). There was a wide range of participants with regard to the time spent using English, 25 years on average, a duration including both their school years and teaching experience. Last but not least, the participants reported their English language proficiency on a scale of one to seven based on their subjective judgements, which revealed a mean score of six. They also self-reported their second language abilities in terms of four different language skills. Table 3 summarizes the self-reported language abilities of the participants in the second experiment.

Table 3 – Self-Reported Second Language Abilities in Experiment 2

Experiment 2	Listening	Speaking	Reading	Writing
A scale of 1-7 (1: none / 7: native-like)	6.0	5.4	6.5	6.2

The table indicates that their weakest skill based on their own judgements was speaking, which can be seen as an expected result since the participants have limited opportunities to practise that skill in a context where the native language is English. Finally, they were asked to report their code-switching tendencies in Turkish and English and they reported that they rarely codeswitch while teaching English when their students have difficulty understanding some concepts in L2.

All the parameters employed before the second priming experiment regarding the level of English language seemed to indicate that the subjects were advanced L2 English users and considered as L1 Turkish-L2 English bilinguals in the current research. Although the possible differences between different proficiency levels in terms of how collocations are process in the bilingual brain is a variable worth looking into, the researcher has decided to ignore it due to time constraints and is willing to look into it in his later research. The beginner level language users were not included in the study on purpose since the entrenchment of collocations and word clusters in their mental lexicon seem to be lacking in early periods of language acquisition and was likely to yield no significant results for the current study. Entrenchment of lexical chunks and formulaic phrases as the proficiency improves or the language exposure time increases is a notion put forward and also proven empirically to a certain extent by research studies taking usage-based grammar models as their basis (e.g. Bybee, 2007; Bybee and Hopper, 2001; Goldberg, 2006; Langacker, 1987, 1988; MacWhinney, 2000; and Tomasello, 2000, 2003).

3.3.2.3. Experiment 3 (Cross-linguistic Collocational Priming in L1 Turkish-L2 English Bilinguals-UK setting)

To address the last research question in the thesis, the writer attempted to run a third priming experiment including the same lexical items exploited in the second experiment in order to investigate a possible language exposure effect. The researcher spent ten months at Exeter University as a Visiting Researcher, so part of the study was conducted in Exeter, UK, where bilinguals who learnt/studied and use English as their second language also took part in the research. There were thirteen participants, postgraduate students at Exeter University and other UK universities (e.g. Sheffield, Nottingham, Cambridge, and Manchester etc.), who had been exposed to the native language environment and living in the UK for at least two years. The participants in the UK were mainly postgraduate students supported by the Turkish government to pursue their MA or PhD studies. After they had attended an English language school in Turkey for at least 4 months, they continued their language studies in presessional programs (i.e. pre-faculty) in the UK for a year, in which students are trained for English for academic purposes. Having finished their presessional English language programs, they had to pass the IELTS test (i.e. get a score of at least 6.0-7.0 depending on the university requirements) to be eligible to start taking their departmental courses. A score of 6.0 in IELTS[21] corresponds to a CEFR level of B2, which is accepted as an upper-intermediate level of English in both receptive and productive language skills. Considering the English language benchmarks the participants had been through and the fact that they had spent at least two years in the UK, particularly in a university

[21] See https://www.ielts.org/ielts-for-organisations/common-european-framework for the correlation table, the rationale of which is summarized in Taylor and Jones (2006).

setting where they are exposed to the language very frequently, the subjects were thought to be a representative group of people, whose responses in priming experiment could be generalized to represent a larger population and can be compared with the results of the second experiment to a certain extent. The researcher contacted more than twenty-five Turkish-English bilinguals with the help of the Turkish Societies at Exeter University and other universities, but only thirteen of them responded and wanted to take part in the third experiment. Finding equal number of participants in the UK and Turkey was difficult due to the number of postgraduate students in the UK who are L1 Turkish-L2 English users as well as their busy school schedules and this can be given as a limitation of the study. Table 4 displays the participant details of the third experiment.

Table 4 – Summary of the Participant Details in Experiment 3

Age[a]	Gender (M/F)	Education	Digit Span[b]	Vocabulary Size[c]	Self-reported proficiency[d]	Years of target language use[e]	Months Spent Abroad[f]	Official Test Scores[g]
Mean: 30.7	F 2/ 15.4%	MA 4/30.8%	Mean: 6.5	Mean: 9.800	Mean: 5.4	Mean: 16.2	Mean: 37.5 (over 3 years)	Mean: 67.8
	M 11/ 84.6%	PhD 9/69.2%						

[a] range=26-51
[b] range=6-8
[c] range=7.100-9.700 [8000-9000 and 6000-7000 word families are required for reading and listening, respectively (Nation, 2006)]
[d] range=4-7 (1: none / 7: native-like)
[e] range=12-23
[f] range=24-78
[g] range=50-87.5 (YDS or KPDS)

The table indicates that the mean age of the participants was 30.7. The population consisted of mainly males (84.6%) and relatively smaller proportion of females (15.4%). The reason for the disproportion of the participants in terms of gender was the limited number of L1 Turkish-L2 English bilinguals in the UK context the researcher could contact with. Nearly 70% of the participants were pursuing their PhD studies and a smaller proportion of them (around 30%) were in the last phase of their MA theses. They have an average vocabulary size of 9.800 word families in English, the smallest being 7.100. According to Nation

(2006), 6.000-7.000 word families are required to comprehend 98% of the spoken English. He further states that spoken language makes more use of the high-frequency words than the written language. Considering the collocational frequency benchmarks[22] set during the item development phase of this study, it was assumed by the researcher that a vocabulary size of around 7.000-9.000 would suffice for the participants to comprehend the lexical items in the priming experiment and that the participants in the second and third experiment can be regarded as L1 Turkish-L2 English bilinguals, whose performance in the collocational priming experiment can be compared. The self-reported language proficiency of the participants was 5.4 over 7, which was 0.6 unit smaller than the participants in the second experiment. The mean value, 37.5 (over 3 years), reflecting the months the subjects spent in the UK setting, taking classes, experiencing daily conversations, writing dissertations and getting feedback as well as taking part in academic discussions in a native language environment, is assumed to make a difference in cross-linguistic collocational priming, if any, which is likely to show the effect of exposure to native language in its natural setting on collocational processing. Last but not least, as the participants reported, the mean value of their official test scores was 67.8. Although some participants reported their TOEFL (Test of English as a Foreign Language) or IELTS (International English Language Testing System) scores, they were converted into YDS score with the help of the correlation tables on the ETS[23] (Educational Testing Service) and ÖSYM[24] (Student Selection and Placement Centre) websites to make them comparable with the scores in the second experiment. Additionally, all the participants stated that their country of residence was the UK when they took the questionnaire and they had been living in the UK for at least two years. English was their second language and none of the participants stated that they knew a third language. They scored their overall language ability as 5.5 over 7 on average. Table 5 below attempts to illustrate the dispersion of self-reported language abilities in four skills.

[22] See Section 3.4.1.1. for an overview.
[23] See the correlation table at https://www.ets.org/toefl/institutions/scores/compare/
[24] See the correlation table at http://dokuman.osym.gov.tr/pdfdokuman/2016/GENEL/EsdegerlikTablosu29012016.pdf

Table 5 – Self-Reported Second Language Abilities in Experiment 3

Experiment 3	Listening	Speaking	Reading	Writing
A scale of 1-7 (1: none / 7: native-like)	5.0	6	5.5	6

It can be seen in the table that based on the participants' intuitions regarding their language abilities, who took part in the third experiment, their strongest skills were speaking and writing, which could have resulted from their experience in a native speaking environment and their special training and practice in writing academic texts in English giving them more confidence in terms of second language production. Finally, the participants were asked to report their code-switching tendencies. They stated that they codeswitch frequently due to their needs in their social environment, especially when they are conversing with their bilingual peers regarding their field of study as they find it easier (i.e. cognitively less demanding) to express some conceptually dissimilar items in English or Turkish through switching between languages.

Considering the differences between the participant groups in Experiment 2 and 3, the possible difference between the structuring of the mental lexicon of the bilinguals who have different L2 exposure and distinct frequency of L2 use is likely to contribute to not only the applied linguistics literature but also the English language teaching literature. Last but not least, the opportunity will pave the way to compare the difference between collocational processing of the two groups based on a well-known model (Model of Lexical Acquisition in L2) in literature by Jiang (2000), which is based on single lexical units, from a collocational perspective. Once the sampling procedures were performed, the next critical step before the priming experiments was the item development phase. The following section explains the exploited tools for item development before giving further details regarding the lexical items employed in each experiment.

3.4. ITEM DEVELOPMENT

The following section summarizes the crucial steps followed for the item development phase of the priming experiments as well as the tools exploited to detect the collocational items (i.e. semi-transparent word combinations according to phraseological perspective), which are above a certain frequency value (i.e. MI score of at least 3.0 and a *t*-score of at least 2.0, based on the recommendations by Schmitt, 2010), noncollocates, filler items and nonwords.

3.4.1. Instruments

3.4.1.1. Corpus of Contemporary American English (COCA) & Turkish National Corpus (TNC)

Two corpora were mainly used to extract the lexical items to be exploited in the experiments based on their collocational frequency values; *t*-score, MI value, and ΔP (delta p) in this research. The Corpus of American English (COCA) by Davies (2008) is considered as the biggest corpus of English which can be accessed free of charge. It is also regarded as the sole large and balanced corpus of American English. Furthermore, it is claimed by its developers that it is likely to be the most widely used corpus of English. It offers unparalleled insight into variation in English. The corpus covers texts from various contexts; spoken, fiction, popular magazines, newspapers and academic texts which were equally distributed with more than 520 million words (1990-2015). The other reference corpus employed for the research study was Turkish National Corpus (TNC) by Aksan et al. (2012). It is reported on the TNC website that the corpus is a balanced and a representative corpus of contemporary Turkish consisting of 50 million words. It includes texts from various genres (1990-2009). It also involves a small proportion of spoken data (2%). As opposed to COCA, TNC in its current trial version does not have POS tagging and does not allow researchers to search for different parts of speech, which can be regarded as a limitation. That is one of the main reasons why the researcher aimed for single word forms rather than lemmas.

The two corpora mentioned above can be considered comparable since the developers state they are balanced, representative and the largest of their kind. Because the study wanted to analyse the impact of frequency on collocational processing, frequent collocations provided by COCA were investigated. The researcher got hold of the COCA list (by Mark Davies, Brigham Young University) including the most frequently used 20000 collocations in English with their MI values computed. The collocations to be used for the priming study, which were ADJ(ective)+N(oun) and V(erb)+N(oun) combinations, were decided upon after they were cross-checked with their Turkish counterparts in the TNC and categorized according to frequency and congruence. For the sake of applicability, only the most frequent 3000 collocation sets were taken into consideration.

MI value, *t*-score, and ΔP values indicating the strength of collocational frequency[25] establish the basis for the item development procedure of the study. That's why, how MI, *t* and ΔP values, which were used as independent variables in the regression and correlation analyses for both languages, are computed and the rationale behind choosing these frequency measures are of great importance. The COCA list, which is the starting point of the item development phase of all the priming experiments, contains a listing of node word / collocates pairs for the top 60,000 lemmas from COCA. There are on average about 220 collocates per lemma. In general, the file contains those collocates that occur at least three times with the node word and which have a Mutual Information score of 1.0 or higher. The formula used to calculate MI score indicating how strong the relationship is between pairs of word in COCA is as follows;

*"MI = log((AB * sizeCorpus)/(A * B * span))/log(2)"*

AB = frequency of collocations (e.g. "strong" used in front of the noun "coffee")

sizeCorpus = how big the corpus is (# word)

A = frequency of node word (e.g. "strong")

[25] See Gablasova et al. (2017) for a comprehensive discussion of association measures.

B = frequency of collocate (e.g. "coffee")
span = span of words (note: we have used 4 Left and 4 Right = 8 word span total)
log(2) = is literally the log10 of the number 2

As far as this calculation is concerned, the bigger the MI value, the stronger the relationship between word pairs. As stated earlier, according to the studies in the literature, the fact that MI value is 3.0 or higher is sufficient to claim that a word pair is a collocation (Durrant and Doherty, 2010). The closer the MI value to 0, the more likely that word pairs in question co-occur randomly. Because there is research (e.g. Gablasova et al., 2017) claiming that MI value may create certain problems in terms of collocational frequency calculation, especially when each lexical item in a collocation has a high frequency, *t*-score was integrated into the item development phase. As is asserted, when the frequency of the lexical items go up, the MI value goes down, which is the opposite in the *t*-score since higher frequency means more evidence for collocations. Therefore, it can be said that MI value may be sensitive to very low frequency words, which could be misleading and ought to be supported by other association measures. The other criteria to measure frequency (i.e *t*-score), which was used to support the MI value in this study, is calculated as follows;

$$t\text{-}score = \frac{O - E}{\sqrt{O}}$$

O: observed frequency of the collocation
E: expected frequency of the collocation

After the observed frequency is subtracted by the expected frequency, the result is divided by the standard deviation. As the literature states, 2.0 or bigger *t*-values indicate a statistically significant difference and is enough to assert that a word pair is a collocation (Durrant and Doherty, 2010). According to Gries (2013) directional measures of collocational frequency (e.g. *t*-score and MI value) has certain flaws and Delta p (ΔP) overcomes those flaws as it normalizes conditional probabilities and it is a product of associative learning theory, which means ΔP can be regarded as a psychologically and psycholinguistically realistic measure. Within this scope, the last integrated criteria to indicate frequency, ΔP is calculated as follows;

$\Delta P_{2|1}$ = p (word$_2$ | word$_1$ = present) − p (word$_2$ | word$_1$ = absent) = (a÷a+b) – (c÷ c + d)
$\Delta P_{1|2}$ = p (word$_1$ | word$_2$ = present) − p (word$_1$ | word$_2$ = absent) = (a÷a+c) – (b÷ b + d)

A sample calculation of ΔP is as follows:

Table 6 – Co-occurrence of the word “of course” in the spoken component of BNC

	course: present	**course: absent**	**Totals**
of: present	5610	168.938	174.548
of: absent	2257	10.223.063	10.235.320
Totals	7867	10.402.001	10.409.898

$\Delta P_{2|1}$ = p (course |word$_2$ = of) − p (course |word$_2$ ≠ of) = $\frac{5610}{174548} - \frac{2257}{10235320} \approx 0.032$

$\Delta P_{1|2}$ = p (of |word$_2$ = course) − p (of |word$_2$ ≠ course) = $\frac{5610}{7867} - \frac{168938}{10402001} \approx 0.697$

The numbers could simply indicate that the word ‘course’ is a better cue to ‘of’ than vice versa. For the reasons stated, in the current study, MI and *t* values were scrutinized upon deciding what items to include in the analysis and ΔP was integrated as a complementary value. The values were reported for each of the collocational items employed in the experiments and computed in the multiple regression analysis. The exploited frequency values in both languages and their mean scores are displayed in Appendix D.

3.4.1.2. Inter-rater Reliability Check

The frequency-based corpus extracted[26] lexical items were classified according to congruence and transparency semi-subjectively and then three objective eyes were consulted for inter-rater reliability. The judges were instructors of

[26] With the help of both COCA and TNC.

English at AUSFL, who passed certain English language standards (e.g. at least 80/100 from YDS and a recruitment exam including an English proficiency test) to have a full-time contract in the institution. They have been teaching English for more than ten years and been using the language for more than twenty years. They were simply given the list of lexical items including the corpus extracted semi-transparent word combinations grouped as congruent and incongruent and asked to state if they agreed on the congruence categorization and transparency levels. The items all the judges agreed on in terms of congruence and transparency stayed on the final list.

3.4.1.3. Semantic Association Test[27]

An important issue to note is the semantic relatedness of the chosen collocational items. To address some of the concerns in the literature, the Edinburgh Associative Thesaurus (Kiss et al., 1972) was used to check if the items were semantically related or to what extent they were semantically related. It is claimed by some researchers (e.g. Durrant and Doherty, 2010) that the link between the two words in the bilingual mental lexicon could be resulting from semantic association rather than collocational patterns. They observed in their experiment that there was collocational priming in semantically associated high frequent collocations. Therefore, they concluded that the notion of semantic association should be taken into account when exploring collocational links in the bilingual mental lexicon. To this end, the chosen items were crosschecked with the Edinburgh database and as long as the collocational items' semantic relatedness level were below three, they were included in the study. 'Three' stands for the number of the participants in the Edinburgh Associative Thesaurus research who stated a particular word was semantically associated with the cue word provided by the researchers. In other words, provided that fewer than three people stated that the adjective 'heavy' was semantically related with the word 'rain', the collocational item was included in the current experiments. In addition to the Edinburgh Associative Thesaurus, a small-scale semantic association test was conducted with the help of 30 (15 for

[27] Conducted only for lexical items in English.

V+N collocations and 15 for ADJ+N collocations) independent subjects, who were not the participants of the priming experiments. They were instructors of English from various universities in Turkey (e.g. Trakya University, İstanbul Medipol University and Zonguldak Bülent Ecevit University), who have been using English as a second language for fifteen years on average (*Range*=12-20). As is discussed in earlier sections of the methodology, the participants who are instructors of English have to fulfil certain requirements to work at a state university in Turkey, such as a minimum score of 80 over 100 from a national foreign language test and passing the recruitment exams of the institutions assessing their proficiency in English and in their field. Therefore, it was assumed that their judgements can be comparable with the participants attending the actual experiments. Because the starting point of the research was the cross-linguistic collocational priming investigation, they were given a list of the head words of the word combinations to be used in the priming experiments (i.e. Experiment 2 and 3) in English and were asked to write down the first three words that they could think of which could be related. As long as less than 20% of them marked the collocate as a semantically related unit with the head word, and on condition that the collocate items were not listed in the first two rows of the semantic relatedness guesses, the lexical combinations were included in the priming experiments. The main purpose was to control semantic relatedness and claim that priming occurs due to collocational links rather than semantic association in the end. It should also be underlined that semantic association could be used as another promising variable in the regression model to investigate its possible influence in future research (see Durrant and Doherty, 2010 for a discussion). A sample test can be seen in Appendix E.

3.4.1.4. Collocation Checklist

A simple checklist was given to a sample group of 10 bilinguals (Turkish L1-English L2), who were instructors of English at various state universities in Turkey and who were different from the participants of the priming experiments. The members of the group have been using English as a second language for eight years on average (*Range*=6-12). As stated under the previous headings, being an instructor of English at a state university in Turkey requires passing certain tests, such as the national foreign language test with a score of at least 80 over 100 and the recruitment exams of the institutions which include proficiency tests in English. It was assumed that passing those tests and working with a full-time contract at a state university can be regarded as a benchmark for a particular proficiency level in English. Therefore, it was thought that their knowledge of the collocational items could be comparable with the knowledge of the participants in the second and third experiments. The participants of Experiment 2 and 3 had an average vocabulary size of 12.400 and 9.800, respectively, which was also assumed to indicate their language proficiency and can be regarded as sufficient proof for adequate knowledge of the exploited collocations, but even so the checklist was used as a secondary step to make sure that the lexical items used in the study were suitable for the target level and that all the participants in the experiments knew the collocations. Although the researcher attempted to make use of the word combinations consisting of high frequent lexical items and which are frequent as a collocation as well, in the study, a checklist was necessary to make a more objective evaluation and avoid disruptive results. It was a simple checklist and the sample group members were asked to put a tick next to the collocation they thought they knew and was frequently used and leave the ones they weren't sure of blank. Only the collocations which were marked as 'I know' by the sample group were included in the study (all the items were marked as 'I know'). The checklist can be seen in Appendix F.

3.4.1.5. Piloting

As the last step of the item development procedure, two pilot experiments (one with Turkish only items and one with cross-linguistic items) were conducted with the help of ten participants each who were instructors of English and did not take part in either of the actual experiments to explore the overall tendencies of the lexical items to be exploited and foresee some methodological problems. An observed problem was regarding case marking of certain prime and target words, particularly in Turkish (e.g. start the car / arabayı çalıştır-) resulting in high error rates or response times with higher standard deviations. To address this concern, some lexical items with case marking were removed from the list.

3.4.2. Experiment 1

Since the first experiment, which included lexical items only in Turkish, was the preliminary step of the second and third cross-linguistic experiments, which consisted of items both in English and Turkish, the same lexical items (i.e. V+N and ADJ+N collocations) chosen for the second and third experiments were employed in the first experiment, as well. Therefore, the detailed explanation of the corpus extraction procedure exploiting both COCA and TNC for frequency and other complementary steps, such as semantic assocation presented for experiment two and three in Section 3.4.3. is also valid for the first experiment. Although the word order for V+N collocations in English is in the opposite direction in Turkish (i.e. N+V), the word order of English was adopted in the first priming experiment so that the results could complement the second and third experiments and the data can be comparable. The collocate items used in the first experiment had a *t*-score of at least 2.0 and an MI value of at least 3.0 in accordance with the recommendations in the literature (e.g. Schmitt, 2010). Noncollocate items, on the other hand, were chosen among the ones with less than 1.0 *t*-score and less than 2.0 MI value[28]. The prime words of the collocate and non-collocate items, which were the primary focus of investigation in each experiment, were controlled for word length and frequency. To be more precise, if the prime of the collocational item had five letters, the prime for the non-collocate item was either four or six letters long (i.e. +/- 1) to avoid any processing difference due to word length. For instance, if the prime word for collocate item was 'soğuk – cold', the prime word of the non-collocate item was 'uzak – far'. In addition, the researcher tried to balance the raw frequency values of the prime words for collocate and non-collocate items in an attempt to prevent possible processing differences due to the entrenchment strengths of

[28] See Section 3.4.1.1. for a detailed explanation of the exploited frequency values and their calculations

the lexical items. TNC was exploited to extract the raw frequency values of the prime words in Turkish. The frequency of the prime words for the collocate (Mean=140.8) and non-collocate (Mean=149.3) N+V items was similar enough to claim that the difference between the two values were not statistically significant. Likewise, the difference between the frequency values of the prime words for collocate (208.84) and non-collocate (Mean=169.03) ADJ+N items were not statistically significant. The full list of prime word frequency values for the Turkish lexical items can be seen in Appendix G. Word length and frequency was particularly important for the prime words of collocate and non-collocate items because the comparison between the mean response times of the two instances was the initial and core analysis of the study to explore a potential priming effect. The mean response times of the two groups were also treated as the dependent variable in the regression models.

When it comes to the development of filler and non-word items, a similar logic followed in the second and third experiments[29] was applied in the first experiment. The prime words of the filler and non-word lexical combinations were random words, which were different from the prime words of the collocate and non-collocate items. While the frequency values of the prime words of filler and non-word lexical combinations were ignored since the mean response times for these items were not included in the final analysis, they were controlled for word length (i.e. +/- 2). As for the target words of the filler and non-word items, the researcher made sure that the word length of the target words of the filler and non-word items was the same as the target words of the corresponding collocate and non-collocate items. To be more precise, if the collocation was ‘yap- hata / make mistake’ and the non-collocate item was ‘al- hata / take mistake’, then the filler item of this set was ‘dürt- pazı / poke muscle’ and the non-word combination was ‘çarp- lati / crash lati’. Since the researcher could not find an online non-word generator for Turkish, he came up with non-words by himself[30] considering the onset, nucleus, and coda of the collocate items. For example, based on the syllable structure of the collocate item

[29] See Section 3.4.3.2.
[30] The Turkish dictionary on The Turkish Language Society website (http://www.tdk.gov.tr/) was consulted.

‘HATA’, the researcher produced the non-word ‘LATİ’ following the same consonant and vowel patterns used in the target lexical item. The word-length of the non-word items as the target word in the priming experiment was the same as the collocate, non-collocate and filler items in a set. A sample set of items was as follows:

	Collocate	**Non-collocate**	**Filler**	**Non-word**
V+N	vermek İZİN	gitmek İZİN	delmek EZAN	sevmek ATEP
ADJ+N	derin UYKU	gizli UYKU	güçlü SELVİ	mutlu EYTİ

It should also be noted that both the piloting and the actual experiment indicated that although the participants responded to collocate and non-collocate items faster, the difference between mean response times of the non-collocate and filler items were not statistically significant, which could tentatively indicate that the difference in processing can be attributed to lexical links (or lack of lexical links) between the items rather than the different syllable structures, phonological density or the length of the word etc. In other words, the mean reactions times of each group of lexical items (i.e. collocate, noncollocate, fillers, and nonwords) complied with what was hypothesized before the experiment. That is to say, as expected the reaction speed of the participants decreased proportionally; (4) nonwords with the slowest reaction times, (3) filler items with relatively faster reaction times than nonwords (2) noncollocate items with faster reaction times than filler items and (1) collocate items with the fastest reaction times. See Appendix H for a full list of Turkish only collocate, non-collocate, filler and non-word items exploited in the first experiment only.

3.4.3. Experiments 2 and 3

As discussed earlier (see section 2.6.1. for the rationale), the current research integrates the two approaches to the definition of collocations and takes frequency as well as transparency (i.e. compositionality) into account. Durrant (2008) states that principal norms of these approaches have very close links with the two sides of the definition of ‘construction’, a term coined by usage-based construction grammars. To be more precise, both refer to linguistic items independently represented in the language system either due to the fact that they are not fully compositional or they are frequent enough to be cognitively efficient to process (Goldberg, 2006, p.5). Thus, it can be said that the two approaches should be regarded as complementary rather than separate frameworks of collocational studies. Although there are many ways words can collocate, for the current study, only ADJ+N and V+N combinations were investigated since they are the most commonly used ones in both the languages and the ones which could represent a certain amount of congruence (Wolter and Gyllstad, 2011; Wolter and Gyllstad, 2013). Another important reason why these combinations were preferred was the fact that the two languages have a different typology. To be more precise, the V+N combinations were investigated in an attempt to find a difference in their processing and possible priming when compared with ADJ+N collocations due to the typological difference between the two target languages. As opposed to the word order in English (V+N / do homework), a noun is followed by a verb in Turkish word order (e.g. ödev yap- / homework do). On the other hand, the word order in ADJ+N combinations is the same for both languages (e.g. white lie / beyaz yalan). If the claim regarding cross-linguistic collocational priming is true, then it is highly likely that 'V+N' combinations will be processed differently from 'ADJ+N' combinations because of the aforementioned typological variety.

As for the frequency analysis in the corpus, the list consisting of 3000 most frequent word partners in COCA was cross-checked with their Turkish counterparts in TNC and the word combinations were ordered starting from the most frequent collocations to less frequent ones based on the MI (Mutual Information) and *t*-scores (showing statistical significance). Although the MI values of the most frequent 20000 collocations were already present in the COCA list, the researcher decided to compute them manually using the COCA outputs since the list contained lemmas; however, the researcher sought for lexical units at the word level (i.e. devoid of case marking). To be more precise, for the Turkish items, plural forms; for instance, were not considered. For

English items; for example, past forms of verbs were disregarded. As stated earlier, the first reason why the current research concentrated on single word forms rather than lemmas was the fact that the trial version of TNC didn't allow POS search option. Another reason to highlight was that according to many linguists (e.g. Hoey, 2005; Sinclair, 1991), lemmatization is likely to fail to reflect essential differences in collocational preferences between different forms of a lemma. The exclusion of lemmatization can also be attributed to Durrant's (2014) results suggesting that the difference between lemmatized and non-lemmatized frequency values in terms of their correlation with the learner knowledge of collocations is unclear.

While choosing the collocational items to be exploited in the experiments, the researcher also paid attention to congruence, which was assumed to be an important variable in the study. Therefore, while the word pairs were being chosen according to frequency in both the languages, the other variable; congruence, was also be taken into consideration in an attempt to investigate any possible collocational processing effect in the cross-linguistic priming analysis. See Table 7 below for a sample categorization;

Table 7 – Categorization of Collocational Items

Congruent Collocations	**Incongruent Collocations**
(adj+noun) heated debate (ateşli tartışma)	*(adj+noun)* high hope (büyük umut)
(verb+noun) give permission (izin vermek)	*(verb+noun)* lose weight (kilo vermek)

The chosen items were semi-transparent word combinations[31], in line with the phraseological perspective and above a certain frequency level (*t*-score of 2.0 and MI value of 3.0), complying with the recommendation in the literature for the frequency based approach to collocations (e.g. Schmitt, 2010). Integrating phraseological as well as the corpus tradition, the current study attempted to investigate only the collocations, semi-transparent (i.e. semi-opaque or semi-

[31] The collocations all three independent judges, who are instructors of English at AUSFL, agreed on in terms of their transparency and congruence were employed in the experiments.

compositional) lexical units. Free combinations were disregarded due to time constraints and the size of the research. Idioms were also ignored since they have been overstudied, though not from a cross-linguistic perspective and for the sake of applicability and convenience. ΔP values, which were not used for item classification and as a frequency benchmark, were computed as the last step and exploited as a promising independent variable in the regression and correlation analyses.

The initial elimination was done according the frequency values. Once the possible items were chosen semi-subjectively, *t*-score and MI values of the possible collocational items were measured manually with the help of a spreadsheet developed by Dr. Philip Durrant at Exeter University and taken into consideration before the final frequency categorization. While assessing the collocational frequency, four-word span option was used, which was confirmed as the recommended value by Jones and Sinclair (1974) in the literature. In order to avoid a priming effect other than cross-linguistic collocation priming in the second and third experiments and not to face misleading data, cognates were omitted from the list. For example, ‘play music’ was excluded because music is a cognate in Turkish.

When the initial categorization of frequent and less frequent English collocations based on COCA was over, the researcher made use of TNC to check the frequency levels of the congruent and non-congruent Turkish counterparts of the English collocations and the *t*-score and MI values from both the analyses were reported (See Appendix D). During the cross-checking process, *t* and MI values of the collocations’ Turkish counterparts were taken into account and were placed in the list on condition that their *t*-scores were higher than 2.0 and MI values greater than 3.0 for both languages, which are regarded as baseline numbers, particularly in corpus linguistics literature for a word combination to be treated as a collocation (Schmitt, 2010). As a result, the researcher came up with 100 collocational items (50 V+N[32] – 50 ADJ+N / 25 Congruent – 25

[32] N+V for the Turkish items, though they were presented in V+N direction in Experiment 1.

Incongruent[33] in each POS). The researcher adopted these values since they are widely cited as threshold for statistical significance in studies exploring formulaic language and collocations (e.g. Hunston, 2002; Stubbs, 1995). MI value by itself considered insufficient by the researcher because it was reported in previous studies (e.g. Gablasova et al., 2017) that the value could indicate very high scores for collocations that involve very low-frequency words even though instances of the word combination were rare. As Schmitt (2010) states if you want to be on the safe side while classifying collocations according to frequency for your study, MI values have to be at least 3.0 and accompanied by a *t*-score of minimum 2.0. It is also obvious that the question of which association measure is the best remains inconclusive, but MI and *t*-scores are the most commonly used ones. The basic difference between MI and *t* values is that *t*-score tends to emphasize frequent collocations consisting of relatively frequent words, whereas MI score is inclined to reflect collocations consisting of less frequent words, but those with stronger links. In addition to *t*-score and MI values, following the classification process, Gries' (2013) ΔP (delta P) score was integrated into the study on the grounds that it considers both the symmetric and asymmetric relation of lexical items in a collocation. Considering the current studies' cross-linguistic approach, investigating the bidirectional relationship of lexical items by means of the ΔP scores and merging them in the regression model as predictors of processing time was thought to be a rational attempt.

3.4.3.1. Steps Followed after Corpus Extraction

As the second phase of the categorization of frequent and less frequent English and Turkish collocations according to their MI, *t* and ΔP values (though this is an additional measure which was not exploited to classify collocations) was over, the researcher got help from three objective eyes, who did not take part in the experiments, by asking their expert opinion as instructors of English and native speaker intuition as L1 Turkish users, particularly for the congruence variable and transparency. These instructors work at AUSFL with a full-time

[33] Valid for Experiment 2 and 3 only.

contract, which means they must have passed certain language proficiency tests and thus their judgements in terms of transparency and congruence of the word combinations should be reliable. Those items, which the reviewers disagreed on with the researcher in terms of the category, were omitted from the list. By doing this, the researcher wanted to make sure the chosen collocational items had an inter-rater reliability in terms of congruence and transparency. As a result, 80 items (40 V+N – 40 ADJ+N / 20 Congruent – 20 Incongruent in each POS) stayed on the list. The last step was deciding whether the chosen lexical members constituting collocations were semantically associated in an attempt to make sure that the relationship between the lexical items were syntagmatic rather than paradigmatic, which was one of the core assertions of the current research. For that purpose, the Edinburgh Associative Thesaurus was ideal. In addition to the numbers obtained from the Thesaurus website, the researcher decided to create his own small-scale semantic association checklist. Each lexical member of the collocations was listed as separate words on a paper and 30 people were asked to write the most related three words they could think of when they see the target items (15 subjects for V+N and 15 others for ADJ+N collocations). As long as 80% of the given answers were not one of the collocational items on the main list, the researcher kept the members on the core cross-linguistic priming experiment list. With the help of this approach, the researcher aimed to control for semantic association of the English lexical items during the regression analysis in which the dependent variable was the response times of the collocate and non-collocate items so that the possible effect of collocational links on priming effect can be discussed. As a result of the semantic association test, 70 items were chosen and included in the final list.

Having extracted the collocations based on frequency values, classified them according to congruence and POS, and controlled them for semantic association, the writer asked for the expert opinion of the instructors of English at Ankara University and other universities who are L1 Turkish-L2 English bilinguals (*N*=10) and who didn’t take part in the actual priming experiments.

They were asked to mark the collocations they knew on a simple checklist including the lexical items to be exploited in the priming experiments. All the previously chosen words were marked as within their knowledge, so all the items were kept in the list at this stage.

As the last step of the item development process, two piloting experiments were conducted, one with Turkish only items and another one with cross-linguistic items in an attempt to observe the behaviours of the chosen collocational items in an experimental setting and explore the possible error rates of each item with the help of ten participants for each pilot experiment who are instructors of English at AUSFL and have not taken part in the actual experiments. In addition to giving an overall idea about the experimental procedures and the possible priming effect, the first piloting revealed some very important details about the exploited lexical items. Since the items in the first piloting experiment were the Turkish members of the selected collocations for the cross-linguistic priming experiments to set a baseline for the following application, some of them had case marking (e.g. kurucu babası – founding father, gök cismi – celestial body, and insan doğası – human nature). It was recognized based on the results of the pilot study that certain lexical items with a case marking revealed high error rates and they took participants much longer to respond than it was assumed. The researcher interviewed the participants and realized the fact that words like “babası-his father”, “cismi-its body”, and “doğası-its nature” were marked as non-words by the subjects since they thought that they were not proper words considering the rules of the Turkish language and the fact that other lexical items had no case marking, which resulted in a distortion in the overall data. As a result, to cope with the problem, those lexical items in question were removed from the overall list.

As for the second piloting experiment, the main aim of the implementation was to find the possible flaws of the chosen lexical items and get feedback from the participants regarding the methodological concerns, such as SOA. It was assumed by the researcher based on the second piloting results, which were in line with the first piloting, that once the problematic lexical items which revealed high error rates (e.g. celestial body-gök cismi) in particular were fine-tuned or replaced with items without case marking, the priming effect would be more clearly observed. As a result, 60 items (30 V+N and 30 ADJ+N – 15 congruent and 15 incongruent in each POS) were chosen both for the first experiment including Turkish only lexical items and the second and third experiments including cross-linguistic items. The adjusted list of collocations can be seen in Appendix I.

3.4.3.2. Development of Non-collocate, Filler and Non-word Items

Another issue that was given much attention and time was the production of non-collocate, fillers and non-word items since the experiment was a Lexical Decision Task and in those tasks, the participants are asked to decide if the presented word is a word or a non-word. By using non-collocate items in particular and non-word items in general as well as significant collocations, the researcher aimed to detect the possible differing response times and the (cross-linguistic) priming effect eventually. The English non-collocate items were developed by referring to COCA and Turkish ones with the help of TNC (*t*-score and MI values less than 1.0 and 2.0, respectively) and the researcher made sure that the prime words in non-collocate members had similar frequency values with the prime words in the collocate items so that there was no disruptive data and to claim that the possible priming effect is not due to the differing frequency of the primes. Based on the comparison between the frequency values of the primes for collocates and non-collocates for congruent and incongruent groups in two POS classification, no statistically significant difference was detected (p=.16 for congruent V+N group, p=.46 for incongruent V+N group, p=.98 for congruent ADJ+N group and p=.27 for incongruent ADJ+N group). The full list of prime word frequency values for the English lexical items can be seen in Appendix J. Table 8 shows the mean frequency values of the prime words for collocate and non-collocate items, which were the core elements of investigation.

Table 8 – Mean Frequency Values of the Prime Words

Congruent		**Incongruent**	
V+N Collocate	*V+N Non-collocate*	*V+N Collocate*	*V+N Non-collocate*
Mean=77198	Mean=59816	Mean=96525	Mean=106301
ADJ+N Collocate	*ADJ+N Non-collocate*	*ADJ+N Collocate*	*ADJ+N Non-collocate*
Mean=52529	Mean=52482	Mean=56637	Mean=64272

Another thing scrutinized was the word length of the prime words in the non-collocate members. For instance, if the prime word in the collocation had five letters, the prime of the non-collocate member had 4-6 letters (i.e.+/-1). Although concreteness and imageabality are used as separate variables in some psycholinguistic research and they are claimed to be contributing factors in response time, the current study did not employ them as separate variables due to timing concerns and could not claim empirically that they were controlled (see Brysbaert et al., 2014 for a discussion of concreteness ratings and empirical evidence indicating a correlation with other measures).

In addition to the non-collocate items, having relatedness proportion concerns, the writer came up with filler items which were obviously non-collocate random word combinations[34] which include lexical items (both the prime and target words) consisting of nearly the same number of letters (-/+1) not to make any difference in response times due to word length. Although the response times of the participants for the filler items were not taken into account in the final analysis, the researcher thought that their differing length may influence the processing times of the following experimental items, which could result in misleading data on the whole. The frequency values of the lexical items exploited as fillers were ignored as the response times for those items were not included in the final analysis.

Following the filler words, non-words were chosen with the help of the ARC non-word database[35] (Rastle et al., 2002) by Mcquaire University for the English words. In an attempt to level the proportion of priming collocates since they are

[34] It was made sure that the chosen combinations revealed no collocational instances on COCA and TNC
[35] See the website at http://www.cogsci.mq.edu.au/research/resources/nwdb/nwdb.html

seen twice in the experiments, the researcher made up one filler item for each set of item groups. In the end, one set of raw script in the experiment read as follows:

make	hata	(L2-L1 collocate)
come	hata	(L2-L1 non-collocate)
wish	pazı	(L2-L1 filler)
help	lati	(L2-L1 nonword)

As stated earlier, because the core application in the experiment was a lexical decision task in which participants were asked to decide whether a target lexical item was a real word or not, the researcher had to make up non-words and random word combinations, which weren't collocations. Though the response times of these items were ignored in the data analysis phase, they were necessary for a reliable research design and the nature of the lexical decision task entailed that. The comprehensive list of non-words and filler items employed in the second and third experiments can be seen in Appendix K.

Although the number of the non-words and filler word pairs in the list are more than 120, the number of the used items based on the L2-L1 vs L1-L2 presentation (i.e. 30 each for the collocate items), were set to 120. Overall, the number of the lexical items exploited during the priming experiment was 60 collocate, 60 non-collocate, 70 fillers and 70 non-words with a relatedness proportion of 0.24 and non-word ratio of 0.27 (see Appendix L to see all the exploited items in Experiment 2 and 3). Relatedness proportion, which is reported as a standard value in lexical priming research, stands for the ratio of accompanying prime-target lexical units out of all the lexical units in a priming experiment. It plays an important role in that higher relatedness proportions are likely to cause participants to discover the relationship between the prime-target lexical items, which could in turn result in strategic priming rather than automatic priming. The recommended value mentioned in Jiang (2012) was adopted in this study. The non-word ratio, which is another important value to consider, represents the proportion of non-words to all the collocational items, non-collocational items, and fillers exploited in the study (see Altarriba and Basnight-

Brown, 2007 for common methodological considerations in priming experiments).

Having finalized the lexical items, the researcher wrote priming experiment scripts for the lexical decision task. For the first experiment, the script included Turkish only items, which were collocate (30 V+N and 30 ADJ+N), non-collocate (60), filler (70) and non-word (70) word pairs (260 items in total). For the second and third experiments, 7 or 8 L1-L2 and 7 or 8 L2-L1 cross-linguistic word combination representing each category (i.e. congruence and POS) were added to the script.

3.5. PRIMING EXPERIMENT DATA COLLECTION

In this study, a primed Lexical Decision Task (LDT) was employed with the help of DMDX[36], a software designed for psycholinguistic research investigating response times. It was developed at Monash University and at the University of Arizona by K. I. Forster and J. C. Forster (2003) and provided as an open-source tool. Both remote and traditional versions were employed since the study had subjects not only in Turkey but also in the UK. The web interface[37] exploited to give instructions regarding the remote application[38] can be seen in Appendix M. The output of the software, mean response times in the priming experiment, was used as the dependent variable in the study, while response times for the filler items and non-words were ignored. The priming experiment scripts for DMDX can be seen in Appendices N (Experiment 2 and 3) and O (Experiment 1).

In a primed LDT, which is essentially a computerised word/non-word discrimination task with accuracy of response and reaction time (RT) in milliseconds as the dependent variable, subjects are initially presented by the prime word, which was either Turkish or English in the current research, and

[36] More information about the software can be found at http://www.u.arizona.edu/~kforster/dmdx/dmdx.htm
[37] The website can be accessed via http://hakancangir.weebly.com/
[38] Guidelines for remote application can be seen at http://psy1.psych.arizona.edu/~jforster/dmdx/help/dmdxhremotetestingoverview.htm

then they are presented with the target word, which was either Turkish or English depending on the prime. In the current research, some of the targets were statistically significant collocations; some were lexical items consisting of non-collocate items and some others were non-words following the orthographical and phonological rules of the target language and some fillers to make sure that the participants could not comprehend the relationship between the presented words and their responses were spontaneous and automatic (i.e. devoid of any conscious lexical selection strategies). The researcher made sure the prime and target words across the given languages were not semantically, phonologically, or orthographically related to avoid factors other than (cross-linguistic) collocational priming. The participants' task was to decide if the target word was a real word in either English or Turkish by pressing a corresponding key on a keyboard[39]. The participants were briefed on the experimental procedures, possible duration of the priming experiment before taking the test, but no explicit instructions were provided regarding a possible relationship between the word pairs to prevent participants from using processing strategies. After the trial session, which included five sample lexical items, and once the researcher made sure that the participants were familiar with the procedure, their responses and error rates were recorded with the help of the DMDX software. The test was followed by an end-of-test questionnaire, in which there were questions about dexterity and vision. The participants were also asked to report whether they consciously saw the flashing words in the priming experiment and if they could recall some items. They were also given a list of the prime words and asked to mark the ones they saw during the experiment a day after they took the test. More importantly, following the application, the researcher interviewed some subjects both in the UK and Turkey randomly and attempted to learn if they were able to detect a relationship between the priming and target words.

As Jiang (2012) states, the LDT is a methodologically simple; however, functionally highly resourceful and one of the most commonly used tasks in

[39] **Right CTRL** for a real word and **Left CTRL** for a non-word for the current study.

word recognition research studies. The basic principle as stated earlier is that participants' response latency while carrying out the task is supposed to reflect how fast target words are processed. By means of analysing the speed of word recognition, activation, selection or processing in general, researchers have the opportunity to gain insight into the processing of lexis. To be more precise, how lexical knowledge is structured and accessed is investigated with the help of the aforementioned task. The fundamental rationale behind the lexical decision task for the current research was that collocations, particularly congruent ones with high frequency, were assumed to be accessed faster (cross-linguistically, for Experiment 2 and 3 only) than noncollocate lexical items or incongruent collocations (for Experiment 2 and 3 only), resulting in faster reaction times. Additionally, it was assumed that the different word order in Turkish and English could hinder cross-linguistic access for V+N collocations. Last but not least, different exposure experiences of the participants in Experiment 2 and 3 were expected to cause different collocational processing patterns. A sample Turkish only and cross-linguistic presentation of the prime and target words in the current study is provided below:

Experiment 1 (Turkish only collocations)

VERB+NOUN[40] (items were presented in random order)

	SCREEN 1	SCREEN 2	SCREEN 3	SCREEN 4	
	* (500 ms)	######### (200 ms)	prime word (100 ms)	target word (response is recorded)	
E.g.	*	#########	vermek	ÖNCELIK	Coll
E.g.	*	#########	gitmek	ÖNCELİK	Non-coll
E.g.	*	#########	yırtmak	iNCELEME	Filler
E.g.	*	#########	vurmak	ANTELiS	Non-word

*target collocation is "give priority"

40 The presentation is V+N order although the regular word order is N+V in Turkish to comply with the output of Experiment 2 and 3.

ADJ+NOUN (items were presented in random order)

	SCREEN 1	SCREEN 2	SCREEN 3	SCREEN 4	
	* (500 ms)	######### (200 ms)	prime word (100 ms)	target word (response is recorded)	
E.g.	*	#########	altın	ÇAĞ	Coll
E.g.	*	#########	kesin	ÇAĞ	Non-coll
E.g.	*	#########	makul	TAY	Filler
E.g.	*	#########	süslü	NÖY	Non-word

*target collocation is “golden age”

Experiment 2&3 (Cross-linguistic)

VERB+NOUN (items were presented in random order)

	SCREEN 1	SCREEN 2	SCREEN 3	SCREEN 4	
	* (500 ms)	######### (200 ms)	prime word (100 ms)	target word (response is recorded)	
E.g. L1-L2	*	#########	yapmak	MISTAKE	Coll
E.g. L1-L2	*	#########	almak	MISTAKE	Non-coll
E.g. L1-L2	*	#########	dürtmek	PRODUCT	Filler
E.g. L1-L2	*	#########	çarpmak	BLUSQUE	Non-word

*target collocation is “make mistake”

	SCREEN 1	SCREEN 2	SCREEN 3	SCREEN 4	
	* (500 ms)	######### (200 ms)	prime word (100 ms)	target word (response is recorded)	
E.g. L2-L1	*	#########	give	İZİN	Coll
E.g. L2-L1	*	#########	live	İZİN	Non-coll
E.g. L2-L1	*	#########	fill	EZAN	Filler
E.g. L2-L1	*	#########	like	ATEP	Non-word

*target collocation is “give permisson”

ADJ+NOUN (items were presented in random order)

	SCREEN 1	SCREEN 2	SCREEN 3	SCREEN 4	
	* (500 ms)	######### (200 ms)	prime word (100 ms)	target word (response is recorded)	
E.g. L1-L2	*	#########	derin	SLEEP	Coll
E.g. L1-L2	*	#########	gizli	SLEEP	Non-coll
E.g. L1-L2	*	#########	güçlü	RESORT	Filler
E.g. L1-L2	*	#########	mutlu	GNOUR	Non-word

*target collocation is "deep sleep"

	SCREEN 1	SCREEN 2	SCREEN 3	SCREEN 4	
	* (500 ms)	######### (200 ms)	prime word (100 ms)	target word (response is recorded)	
E.g. L2-L1	*	#########	cold	SAVAŞ	Coll
E.g. L2-L1	*	#########	rich	SAVAŞ	Non-coll
E.g. L2-L1	*	#########	brief	NEFRET	Filler
E.g. L2-L1	*	#########	cute	SAGİT	Non-word

*target collocation is "cold war"

Participants in each experiment saw 120 words in total including all the categories (i.e. thirty ADJ+N and thirty V+N collocations and sixty non-collocates) as the core items, the mean responses of which were exploited in the analysis, apart from the fillers and non-words. For Experiment 1, all the items were in Turkish as it was aiming to detect collocational priming in Turkish. For the second and third experiments, half of those items were congruent and the other half was non-congruent (i.e. fifteen congruent and fifteen non-congruent items in each category). Furthermore, seven or eight items in each congruent vs. incongruent category were labelled as either in L1-L2 or L2-L1 direction.

Because the design of the lexical decision task requires including non-words and made-up words (i.e. fillers) into the presentation, 120 non-words and random word combinations in total were integrated into the priming presentation in each experiment. Moreover, for relatedness proportion concerns (i.e. to prevent the participants from understanding the link between the lexical items), twenty more filler and non-word items were added to the priming experiments and the proportion was set to 0.24 and non-word ratio to 0.27 based on the remarks in earlier research in the literature (see Jiang, 2012 for a broader explanation). You can see a visualization of the number of the core items in Table 9.

Table 9 – A Detailed Categorization of Lexical Items (Experiments 1, 2 and 3)

Experiment 1		**Experiments 2 and 3**	
Verb+Noun	**Adj+Noun**	**Congruent**	**Non-congruent**
30 collocations	30 collocations	15 verb+noun collocations (7 or 8 L1-L2 vs L2-L1)	15 verb+noun collocations (7 or 8 L1-L2 vs L2-L1)
		15 adjective+noun collocations (7 or 8 L1-L2 vs L2-L1)	15 adjective+noun collocations (7 or 8 L1-L2 vs L2-L1)
60 word combinations (collocations only) *120 word combinations (collocate+non-collocate items)* *260 (collocate+non-collocate+non-word+random lexical combination)*			

*a comprehensive list including the filler items and non-words only in Appendix K and all the exploited items merged in H (Experiment 1) and L (Experiment 2 and 3)

Another issue scrutinized by the researcher was a methodological issue discussed in the priming literature, stimulus onset asynchrony (SOA), which stands for the interval between the onset of one stimulus (i.e. prime) and the onset of another (i.e. target) within the same trial (Jiang, 2012). It is claimed that participants need time to use strategic processing during lexical priming experiments and that strategic processing is believed to take place at later stages of processing. To be more precise, when the SOAs are longer than 250 milliseconds, participants are thought to process the lexical items consciously and likely to respond with the help of some strategies (Posner and Snyder, 1975). If the SOA is longer than 250 milliseconds, participants tend to consider the relationships between the prime and target pairs which could yield stronger priming effects (de Groot, 1984). Neely (1991) also asserts that automatic processing appears to take place with SOAs less than 250 milliseconds. McNamara (2005) states that when the SOA is short enough, participants' attention is not focused on the prime word long enough to lead to semantic matching. Therefore, he suggests that those willing to explore the automatic aspect of semantic or associative priming ought to have an SOA of 200 milliseconds or less. In a study investigating collocational priming in English, for instance, Durrant and Doherty (2010) conducted two experiments with English native participants. In the first experiment, they employed an SOA of 600 milliseconds, the result of which indicated a strong priming effect for frequent collocations, in particular. In an attempt to explore the automatic priming rather than strategic priming as opposed to their first experiment, they used an SOA of 60 milliseconds in their second attempt based on the remarks by Lucas (2000) stating that long SOAs are likely to reflect strategic priming effects rather than automatic processes in the mental lexicon. They concluded that priming effect was observed in associated and high frequency collocations only. Many studies in the field of psychology (e.g. Perea and Gotor, 1997) assert that with SOAs of 60 milliseconds or less, which is believed be the benchmark for masked priming experiments, semantic priming is still observed. They say if you want to employ a masked priming experiment, SOA needs to be as low as 50-60 milliseconds. Some other language acquisition studies (e.g. Wolter and Gyllstad, 2011) claim at least 150 milliseconds is necessary to detect a collocational priming effect especially in the context of second language users. They replicated a study by Bonk and Healy (2005) and employed 250 milliseconds SOA in their priming experiment.

In the light of the claims and discussions in the literature as well as the feedback received from the piloting phase, a 100 millisecond SOA was preferred over 50-60 or less milliseconds SOA since the participants of the second and thirds experiments were advanced L2 users, but not native speakers, which is in line with Jiang’s (2012) remarks. Although the present study does not claim that it employs the masked priming paradigm, all the necessary precautions are taken to make sure that lexical processing is automatic. In an attempt to reduce the chance of strategy use by the subjects, the items were presented randomly and the relatedness proportion was set to 0.24. Furthermore, considering the possible difference in response times of L1 and L2 target words by the Turkish-English bilinguals (Turkish natives) and the nature of the cross-linguistic priming experiment, which was the starting point of this research (i.e. Experiments 2 and 3), the standard 50 or 60 milliseconds of SOA was thought to create a problem in terms of the processing of L2 words. That's why a longer SOA was chosen. Following each experiment, the participants were asked to declare if they had consciously detected the flashing (priming) words. If their answer was yes to a certain extent, they were asked to recall and report some of them.

3.6. POST EXPERIMENT DATA COLLECTION

Once the priming experiments were conducted, some complementary procedures were followed to meet certain methodological requirements. Section 3.6.1. explains the instruments employed and their output which was exploited to ensure that the results of the priming experiments were reliable and to avoid misinterpretations.

3.6.1. Instruments and Results

3.6.1.1. End of Test Questionnaire

The questionnaire included questions regarding dexterity, vision, gender and the priming words. The participants were asked to give details about their dominant hand, possible eyesight and short-term memory problems, and a standard variable, sex. Table 9 summarizes the responses of the participants in each experiment.

Table 10 – Summary of End-of-test Questionnaire

GROUP	Gender	Dexterity	Vision	Short-term Memory
Experiment 1 (*N*=28)	20 Female 8 Male	27 Right 1 Both	None stated any serious issues	None stated any serious issues, in line with digit span scores
Experiment 2 (*N*=30)	16 Female 14 Male	28 Right 1 Left / 1 Both		
Experiment 3 (*N*=13)	2 Female 11 Male	12 Right 1 Left		

The information of participants' dominant hand is requested in an attempt to detect possible reaction times with very high and unexpected standard deviations or high errors rates, which could result from dexterity and failing to respond accurately using the assigned keys on the keyboard. Visual problems are also checked in order to prevent any misleading data which may be due to an eye-sight problem. The participants were also asked to state if they consciously saw the prime words, which were used during the priming experiment by flashing for 100 milliseconds. This question was necessary on the grounds that the researcher wanted to assure the participants did not use any strategies while processing prime words, and that their effect on the following words was automatic rather than conscious. 100 milliseconds of presentation during the experiment was supposed to result in unconscious detection and processing of the words in the mental lexicon according to Jiang (2012) and Altarriba and Basnight-Brown (2007). Based on the remarks of the participants, the researcher claimed that the participants' responses were recorded during natural language processing and that the processing of the lexis was automatic. The questionnaire can be seen in Appendix P. Considering all the participants in each experiment, 13,8% of them said they didn't see any of the prime (flashed) words, 28,7% of them said they recognized a few of the prime words, 35,1% of them said they detected some of the prime words, and 22,3% of them claimed they saw most of the prime words.

Following the end-of-test questionnaire, the researcher randomly chose and interviewed some of the subjects in each experiment who stated they saw many of the prime words. They were asked to state if they were able to discover a link between the prime and target words just to make sure that they weren't using any strategies during lexical processing. None of the interviewed subjects in each experiment was able to detect the collocational relationship between the lexical items although they claimed they saw the flashing prime words, the reason of which could be related to the relatedness proportion and the non-word ratio set before the experiments and explained earlier. It was also recognized that a large proportion of the words (supposedly prime words) they claimed they saw and were able to recall were mainly the target words which were purposefully designed to stay on the computer screen long enough for them to give a response.

3.6.1.2. Priming Word Checklist

It was designed as an additional tool to the section in the end-of-test questionnaire and the following interview. It is a simple checklist including the prime words exploited during the priming experiment and some other unrelated words which were included in the list so that participants' answers were not just random responses. The researcher gave the list to randomly chosen subjects in Experiment 2 and 3 only who stated that they saw some or many of the flashed words and wanted them to recall and mark the words that were flashed during the experiment for 100 milliseconds. There was a similar section in the end-of-test questionnaire asking the participants to report the flashing words that they claimed to have detected during the experiment. The answers in that section and the ones on this checklist were compared. The researcher wanted to make sure participants did not see the flashing words (at least consciously) and even if they saw, they could not understand the link between the prime and target words. The answers of the participants in Experiment 2 and 3 who responded to the checklist revealed that the responses were nothing more than random selection of words as their answers included considerably more random words than the prime words exploited in the experiments, which is in line with the answers from the end-of-test questionnaire in a way. The checklist can be seen in Appendix Q.

3.7. DATA ANALYSIS PROCEDURES

3.7.1. Experiment 1

Following the lexical item development phase, which provided important insight into some of the problematic lexical items with the help of piloting and which included other complementary steps employed to choose and categorize the collocations reliably by controlling some variables like semantic association, the collocations were fine-tuned and the first experiment was carried out with the help of the DMDX software. The output was organized by means of the supplementary software "Analyze"[41] and the response times for collocate and non-collocate items were grouped, whereas the response times of filler items and non-words were excluded from the final analysis. Complying with the recommendations in the literature, incorrect responses (20% or more) in all three experiments were excluded from the final data analysis for the current study as well (see Jiang, 2012 for a discussion). Furthermore, response times, which were outside 2, 2.5, or 3 standard deviations of the mean RT of the same participant were not included in the analysis, in line with much earlier research (Jiang, 2012). Last but not least, the response times, which were lower than 200 milliseconds and more than 2500, were treated as outliers on the grounds that it is not likely for a participant to recognize a word and respond accordingly in less than 200 milliseconds and 2500 milliseconds is long enough for a participant to recognize a word and make a decision even if it is a low-frequency word (See Jiang, 2012 for a more detailed explanation on methodological considerations for lexical decision tasks). As a result, although 41 participants attended in the first experiment, only the responses of 28 participants were accepted for the final analysis due to the cut-off points mentioned above. The trimmed data from the priming experiments based on the extreme reaction times for the collocational items was 9.8%, which means 89.2% of the response times were kept for statistical analysis for the first experiment.

After the response times were fine-tuned, the data sets from the first priming experiment (i.e. the mean response times of the collocate and non-collocate items), were put into the Statistical Package for the Social Sciences (SPSS) 23 software for a comparison of mean response times with the help of a paired sample *t*-test looking for a possible priming effect. In addition, a multiple regression and correlation analyses were computed in search for the relationship between frequency and collocational priming as well as predictors

[41] It can be accessed via http://www.u.arizona.edu/~jforster/dmdx/

of mean response time. The dependent variable was set as the mean response times provided by DMDX as a result of the priming experiment, and the independent variables were frequency (*t*-score, MI value, ΔP, and log-transformed frequency of the target word) in Turkish and POS.

3.7.2. Experiments 2&3

The same data analysis procedures reported for the first experiment were followed for the second and third experiments. Therefore, the steps mentioned in the previous section are valid for all the experiments. Because the LHQ, vocabulary size test, which were mainly used for sampling purposes, and end-of-priming-test questionnaire were online applications, the results were extracted from the online platforms as an excel file and descriptive details were reported with the help of SPSS. Following the overall descriptive explanation of the subject population, the results of the priming experiments were classified and fine-tuned with the help of a supplementary tool named “Analyze”, which was developed by the developers of DMDX. The software enables the researchers to organize the DMDX output file according to certain labels, which were POS (V+N and ADJ+N), congruence and L1-L2 vs L2-L1 in the current study. Therefore, the mean response times of each collocational and the complementary items were computed by the software and then classified based on the pre-defined categories. The same cut-off values indicating accepted error rates, standard deviations and response time applied for the first experiment were also used in the second and third experiments. As a result, 11.2% and 8.3% of the items were trimmed from the overall data for the second and third experiments, respectively, leaving 88.8% and 91.7% of the data for the final analysis.

The first core statistical analysis was computed on the mean response times of the collocate and non-collocate items to explore a possible priming effect with a paired sample *t*-test. Having compared the mean scores, the researcher conducted a regression analysis in an attempt to explore the significant indicators of response time in the cross-linguistic priming experiment. Within the regression analysis, partial correlations were also computed and the significant correlations were reported in order to support the regression output. The dependent variable in the second and third experiments was set as the mean response times of the collocate and non-collocate items provided by DMDX as a result of the priming experiments, and the independent variables were frequency in both languages (*t*-score, MI value, ΔP, and log-transformed frequency of the target word), congruence, POS (to indicate a typological difference), the direction of the prime (L1-L2 vs. L2-L1).

In addition to the analysis based on the mean response times of the items, each participant's mean response times for collocate and non-collocate items were also computed by means of "Analyze" software and the participants were tagged as UK or Turkey so as to investigate the possible difference in the mean response times in two different language exposure settings with an independent samples *t*-test to look into the possible effect of language exposure further. Furthermore, the mean response times of collocate and non-collocate items by the participants in Experiment 2 and 3 were reported for an overall comparison between the response times of certain groups of lexical items by the bilinguals in the UK and Turkey. Finally, the comparison between the regression and correlation analyses in two different settings in Experiment 2 and 3 were also presented.

3.8. SUMMARY OF THE STEPS FOLLOWED BEFORE, DURING, AND AFTER THE PRIMING EXPERIMENTS

Certain steps have been followed before, during and after the priming experiments based on the recommendations in the related literature to have a stronger experimental baseline. The steps presented below exclude the item development phase and attempts to provide a summary of the followed procedures throughout the process.

1) Before experiment 2 and 3, the participants were asked to answer the LHQ including questions about age, gender, language learning experiences, the length of their second language exposure, their self-reported proficiency, and official proficiency test scores etc.

2) Following the LHQ, the participants of Experiment 2 and 3 sat a vocabulary size test in order for the writer to claim that they had similar proficiency levels in English. It was claimed based on earlier research (e.g. Milton, 2010; Meara, 1996) that vocabulary size seems to correlate with overall language proficiency.

3) A digit span test was employed as a standard procedure before each priming experiment to make sure that the participants did not have any problems regarding their short-term memory. The range was 6-8; that is, all the participants were able to remember at least 6 digits of number.

4) Having completed the LHQ and vocabulary size steps (for experiment 2 and 3 only), the participants were asked to take the collocational priming experiment. A lexical decision task was employed for each experiment with an SOA of 100 milliseconds. The tasks simply required the participants to decide whether the words that appear on the screen are real words either in Turkish or English or not by pressing the corresponding keys on the keyboard (i.e. Right CTRL for a real word and Left CTRL for a non-word for the current study). Laboratory facilities of Ankara University were used for the experiments and some participants took the remote version of the experiment in a controlled setting. The relatedness proportion was set to 0.24 and non-word ratio to 0.27 based on the suggestions by Jiang (2012).

5) After the priming experiments, the participants were given an end-of-test questionnaire including questions about dexterity, vision and prime words asking the participants to report the prime words they can recall.

6) A day after the experiments, the participants were given a checklist of the prime words flashed during the experiments and were asked to state if they detected them on screen consciously.

7) In addition to the checklist, the writer randomly chose some subjects who took the priming experiment and stated they saw some of the prime words and asked them if they were able to detect any relationships between the prime and target words, such as semantic relatedness or collocational links.

8) The output of the priming experiments, the difference between the mean response times of collocate and non-collocate items, was scrutinized to explore a possible collocational priming effect. Due to the design and the purposes of the current study, the mean response times of non-words and fillers were ignored.

9) Because the writer was investigating the relationship between collocational priming and various variables, such as frequency, congruence, typology, priming symmetry etc., regression and correlation analyses were computed to expound upon possible associations and make certain predictions.

Chapter 3 has tried to summarize the sampling method and exploited instruments and give a detailed description of the participants in each experimental setting so far. The next chapter will deal with the findings of the experiments and provide an initial discussion for each.

CHAPTER 4
FINDINGS AND INITIAL DISCUSSIONS

4.1. INTRODUCTION

This chapter includes mainly the numerical data gathered from the three priming experiments and regression and correlation analyses exploring the effect of frequency, congruence, part of speech, and presentation direction on collocational processing on the whole, and collocational priming in particular. Each experiment is discussed separately and SPSS results are reported under three main headings; Experiment 1 exploring collocational priming in Turkish, Experiments 2 and 3 investigating cross-linguistic collocational priming in L1 Turkish-L2 English bilinguals.

Following the results of the experiments, the writer provides a discussion for each experiment based on the suggestions by Jiang (2012) and referred to the layout provided in his book. There are two excerpts from his book showing the proposed interpretation method.

Sample 1

Result: When a prime is masked, bilinguals respond to an L2 word faster in a lexical decision task when it follows its L1 translation than when it follows an unrelated L1 word; they respond to an L1 word in the same amount of time when it follows its L2 translation or an unrelated L2 word.
Interpretation: Masked translation priming is asymmetrical in lexical decision; it occurs only from L1 to L2, but not from L2 to L1.

Sample 2

Result: Bilinguals translate faster from L2 to L1 than from L1 to L2
Interpretation: The lexical links in the L2-L1 direction are stronger than those in the L1-L2 direction.
Explanation: L2-L1 links are strong because lexical links between the two languages are established while bilinguals learn an L2, and it is more likely for them to associate an L2 word with its L1 translation than the reverse.

Extending Jiang’s approach in discussion, the current research addresses the research questions at the beginning of each of the following headings and the findings are discussed within the scope of each question and assumption. The findings of each experiment are discussed separately in details before overall remarks are made.

4.2. RESULTS

This section of the study presents the numerical output of each priming experiment and then provides an initial discussion of the observed priming effect as well as the results of the regression and correlation analyses, respectively.

4.2.1. Experiment 1 (Turkish Priming Experiment)

Although there were 41 subjects taking the priming test, the answers of only 28 subjects were accepted as reliable and included in the study due to the 20% error rate benchmark set before the experiment, which is also indicated as the recommended cut-off error rate in previous studies (Jiang, 2012). Furthermore, the responses faster than 200 milliseconds, slower than 2000 milliseconds, and the items with more than 2.0 standard deviation were trimmed from the overall data (89.2% of the response times were kept for statistical analysis). The results of the Turkish L1 participants’ responses are displayed in Figure 19 as an overview.

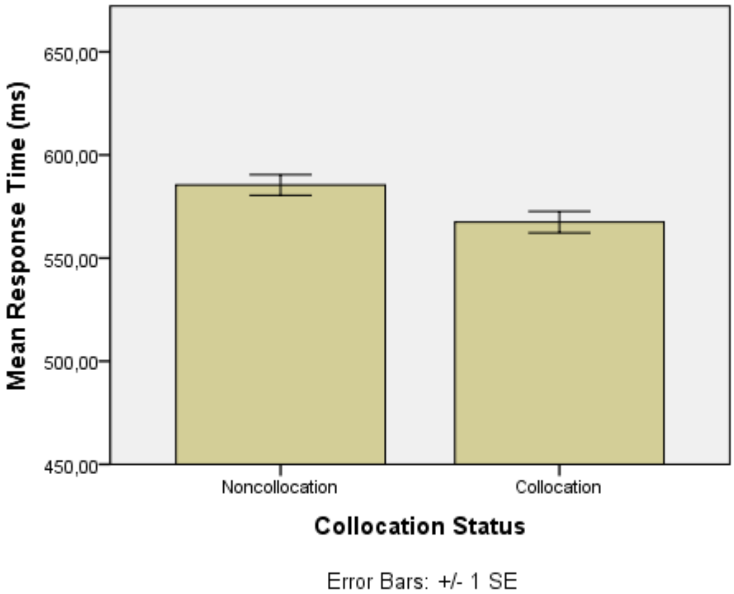

Figure 19 – Mean Response Times in Milliseconds (All items merged)

The general look at the output reveals a possible collocational priming effect, a 567.4 millisecond reaction time for collocate items and a 585.5 millisecond reaction time for the non-collocate ones (i.e. an 18-millisecond gap) when the lexical items are analysed as whole; that is, when the items were not classified according to POS. Figure 20, on the other hand, attempts to provide a general overview of the mean response time according to two different POS groups.

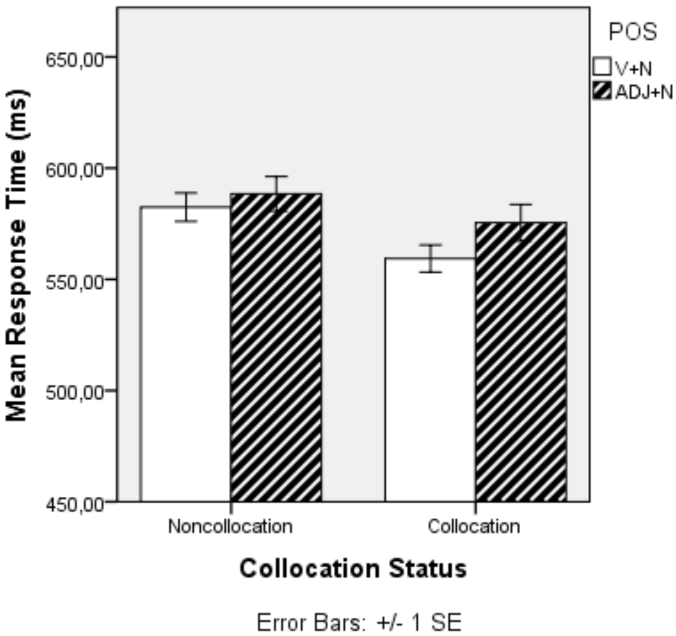

Figure 20 – Mean Response Times in Milliseconds (POS)

When the reaction times were classified according to part of speech, a possible priming effect for both ADJ+N and V+N collocatins items was observed. It can initially be deduced from the figure that V+N collocations revealed faster reaction times than ADJ+N collocations. The mean reaction time for V+N collocations was 559.3 milliseconds and it was 582.5 for non-collocate items of the same part of speech group. On the other hand, the mean reaction time for ADJ+N collocations was 575.5 milliseconds and it was 588.5 for ADJ+N non-collocate items. Table 11 elaborates the output of the priming experiment by providing the error rates, standard deviations, and the statistical strength of the reaction time difference between the lexical items.

Table 11 – Mean Response Times in Milliseconds, Standard Deviations in Parenthesis and Error Rates in Square Brackets

GROUP	Number of lexical items	Collocation RT	Non-collocates RT	Priming Effect
Experiment 1 Turkish ONLY items *(N=28)*	60 items (120 total)	As a whole 567.4 (40.14) [1.52%]	As a whole 585.5 (38.89) [1.46%]	18.1 **p=.001, r=.41*
	30 items (60 total)	V+N 559.3 (33.54) [1.84%]	V+N 582.5 (34.92) [1.23%]	23.2 **p=.009, r=.46*
	30 items (60 total)	ADJ+N 575.5 (44.91) [1.24%]	ADJ+N 588.5 (42.89) [1.7%]	13.0 **p=.05, r=.36*

*The significance level is .05

The results indicate that there appears to be collocational priming in Turkish and the priming effect can be regarded as statistically significant at the level of *p <.05* for each condition. However, the priming effect seems to be stronger in V+N combinations than in ADJ+N collocations (a 23.2 difference for the former, whereas a 13.0 difference for the latter). The effect size of the priming effect including all the lexical items was strong at the level of *r=.41*. The effect size of the individual groups seem to differ, the former having a strong effect size (*r=.46)* and the latter demonstrating a medium effect size (*r=.36)*. As an extension to the priming analysis, a regression and a correlation analysis were carried out to detect the possible relationship of frequency and part of speech with the processing of collocations and the significant indicators of mean response times in Experiment 1. Table 12 attempts to summarize the results of the regression analysis based on the first priming experiment.

Table 12 – Regression Results

	b	***SE b***	**Beta**
Model			
Constant	619.920	14.545	
POS	14.387	6.814	.179*
Target word frequency	-23.308	7.554	-.285*
TR *t* score	.643	1.004	-.085
TR MI score	3.832	3.144	.347
TR $\Delta P_{1\|2}$	-39.370	26.384	-217
TR $\Delta P_{2\|1}$	-23.963	25.286	-.131

Note for model 1: R=.543[a] and R^2=.2295 (p<.001)
* The significance level is p<.05

The results of the analysis indicated the predictors explained 22.9% of the variance (R^2=.229, F=4.76, p<.001) for the model. The numbers revealed that the most significant indicators of the mean response time in the collocational priming study were part of speech (β=-.179, p=.05 and log-transformed target word frequency (β=-.285, p=.05). *t*-score in Turkish also seemed to play a role in the cross-linguistic collocational processing, but making a strong statistical claim was not possible due to the *p* value bigger than .05. It could be claimed based on the numbers that part of speech (i.e. whether the presented item was V+N or ADJ+N) and the frequency of the target items in the priming application appeared to have a partial impact on the mean response times of collocate and non-collocate items and eventually might have influenced the priming effect. Because part of speech was an important indicator of mean response time in the priming experiment and it was assumed that a regression analysis for each part of speech group could give better insight into the effect of frequency on collocational processing, he decided to compute the regression analysis for V+N and ADJ+N collocations separately and report the differences. Table 13 and 14 summarize the comparison of the regression results for the part of speech groups. Table 13 presents the regression model for V+N group, initially.

Table 13 – Regression for V+N

	b	*SE b*	Beta
Model			
Constant	607.358	18.959	
Target word frequency	-14.144	10.280	-.201
TR *t* score	-1.128	1.038	-.171
TR MI score	3.344	3.784	.338
TR $\Delta P_{1\|2}$	-67.542	34.092	-.366*
TR $\Delta P_{2\|1}$	-59.912	35.495	-.315

Note for model: R=.567[a] and R^2=.322 (p<.001)
* The significance level is p<.05

For comparative purposes, Table 14 presentes the regression model for the ADJ+N group. The numbers indicate the possible predictors of mean reaction time in Experiment 1.

Table 14 – Regression for ADJ+N

	b	*SE b*	Beta
Model			
Constant	653.021	28.738	
Target word frequency	-35.584	15.288	-.388*
TR *t* score	-4.459	4.069	-.530
TR MI score	-8.175	11.562	-.690
TR $\Delta P_{1\|2}$	85.784	103.124	.485
TR $\Delta P_{2\|1}$	57.777	83.980	.325

Note for model: R=.462[a] and R^2=.214 (p<.05)
* The significance level is p<.05

The numbers indicate that for the V+N group, $\Delta P_{1|2}$ was an important indicator of response time in the priming experiment, which could also account for its effect on the processing speed, whereas for ADJ+N group, target word frequency was the significant predictor of mean response time. In other words, rather than the frequency of the collocations, the frequency of the single words played a more important role in the processing of ADJ+N collocations. Therefore, it can be said that collapsing the data under two different groups help understand the effect of frequency on collocational priming better. Together with the regression analysis, correlations were also computed to explore and report the potential relationship between each independent variable and the mean response times, which could signify the conceivable factors contributing to the priming effect. Table 15 illustrates the significant correlations between the mean response times in the first priming experiment and the frequency values.

Table 15 – Correlation Results

	Mean Response Times
Collocation status	-.224* / r_{pb}= -.22**[42]
Target word frequency	-.346**
t score	-.334**
TR $\Delta P_{1\|2}$	-.248**
TR $\Delta P_{2\|1}$	-.199*
MI score	-.166*

**Correlation is significant at the .01 level
*Correlation is significant at the .05 level

The correlation analysis of the collocational priming experiment concludes that the mean response times of the Turkish native participants appear to correlate with collocation status (*r*=-.224, *p*.05), target word frequency (*r*=-.346, *p*.01), *t*-score (*r*=-.334, *p*.01), $\Delta P_{1|2}$ (*r*=-.248, *p*.01), $\Delta P_{2|1}$ (*r*=-.199, *p*.05), and MI (*r*=-.166, *p*.05) scores in Turkish. To be more precise, considering the statistically significant negative correlations, as the frequency values provided in the table increase, the response times of the participants decrease. In other words, they are more likely to respond to and process high frequency collocations faster. Apart from the TR $\Delta P_{2|1}$ and MI score which indicated a weak correlation, all the other frequency values revealed a moderate correlation. Another expected result was the effect of target word frequency on the processing of lexical items. Although the lexical items were collocations and the experiment was designed to test collocational links in the mental lexicon, it was clear that single word frequency was still playing an important role mainly because of the nature of the lexical decision task. Furthermore, whether the lexical items in the experiment were collocations or not had a negative moderate correlation with the response times. In other words, based on the negative correlation, when the combinations were collocations, participants responded faster in the priming experiment. Although a direct causation cannot be established based on the correlation results, these relationships could be interpreted as possible contributing factors to the priming effect, which needs to be discussed further and backed up with

[42] Point-biserial correlation coefficient of each binary variable has been computed manually and reported separately throughout the text.

further empirical data. To be in line with the regression analysis part, another correlation analysis was conducted for V+N collocations and ADJ+N collocations separately. Tables 16 and 17 illustrate the relationship between the mean response times in the priming experiment and frequency values according to two separate part of speech groups. Initially, Table 16 presents the numerical output of the V+N group.

Table 16 – Correlation for V+N

	Mean Response Times
Collocation status	-.325** / r_{pb}= -.32**
Target word frequency	-.310**
t score	-.408**
TR $\Delta P_{1\|2}$	-.375**
TR $\Delta P_{2\|1}$	-.400**
MI score	-.260*

**Correlation is significant at the .01 level
*Correlation is significant at the .05 level

In an attempt to draw an analogy, Table 17 displays the possible correlations between mean reaction times of ADJ+N collocations and their frequency values.

Table 17 – Correlation for ADJ+N

	Mean Response Times
Collocation status	-.148 / r_{pb}= -.15
Target word frequency	-.405**
t score	-.289**
TR $\Delta P_{1\|2}$	-.181*
TR $\Delta P_{2\|1}$	-.106
MI score	-.096

**Correlation is significant at the .01 level
*Correlation is significant at the .05 level

As is seen in the tables, there are stronger significant correlations in the V+N group. All the frequency values reflected significant correlation with the mean response time, ΔP values in both directions (*r*=-.375, *p*.01, *r*=-.400, *p*.01) and *t-score* (*r*=-.408, *p*.01) with the strongest negative correlations, whereas MI score with a moderate negative correlation (*r*=-.260, *p*.05). As for the ADJ+N group, there are still significant correlations, but only a medium one for target word frequency (*r*=-.405, *p*.01), a weak one for *t-score* (*r*=-.289, *p*.01), and an even weaker correlation for $\Delta P_{1|2}$ (r=-.181, p.05). On the whole, it can be stated that V+N collocations, which revealed a more robust priming effect in the experiment, could be considered better at explaning the relationship between the frequency effect and collocation processing than ADJ+N collocations. Some additional interpretations will be provided in the discussion section. L1 Turkish (L2 English) participants' responses in the priming study, the partial priming effect, the correlations of the frequency values with response times, and the predictors of mean response time set a baseline for the main experiment and gave a rationale to the researcher to proceed to the cross-linguistic priming experiment. The following section addresses the related research questions and assumptions in relation to the findings of Experiment 1 and discusses the possible initial implications.

4.2.2. Experiment 1 – Initial Discussion of the Findings

Research Question 1
To what extent does collocational priming, if any, exist in Turkish?
Research Question 2
Does item frequency play a role in collocational priming in Turkish?

The initial tentative conclusions that can be drawn from the results is that there seems to be a collocational priming in Turkish in the bilingual mental lexicon and frequency plays a partial role in the process. Part of speech and log-transformed target word frequency were two significant indicators of mean response time in the priming experiment. Participants' mean response times for V+N collocations were considerably lower than ADJ+N collocations and the fact that part of speech is a significant indicator for mean response time could be explained by referring to that finding. Furthermore, it must be emphasized that although one can detect a significant priming effect for both part of speech categories, the difference between the mean response times of V+N collocations and V+N non-collocations (23.2 milliseconds) is relatively bigger than the difference between the corresponding mean response times of ADJ+N combinations (13.0 milliseconds), which could indicate that verbs produce more significant priming effects than adjectives for Turkish native users (who were also regarded as L1 Turkish-L2 English bilinguals in the current study). According to the correlations provided by the regression analysis, there is a significant negative correlation (medium to weak) between target word frequency, association measures (*t*-score, $\Delta P_{1|2}$, $\Delta P_{2|1}$, and MI) and mean response times, which seems to show that frequency is playing a crucial role in the processing of collocations.

According to Bybee (2007) "words used together fuse together". Likewise, Hoey (2005) asserts that words are primed to co-occur and the activation of the node spreads to the collocate. The priming is claimed to form the basis of our creative language system. Exploring the existence of collocational priming in Turkish, the current research sought to illuminate the role frequency plays in a possible priming effect in Turkish and address the subject of mental dictionary organization from a syntagmatic point of view. The discussion below attempts to unpack some of the patterns observed in the findings based on three different analyses; priming, correlation and regression.

As discussed at the beginning of this section, the initial overall conclusion that can be drawn with the help of the output from Experiment 1 is that collocational priming appears to exist in Turkish for ADJ+N and V+N (though regular word order is N+V in Turkish) collocations with no case marking, which could indicate that the activation of the node spreads to the collocate and facilitates the collocational processing. Furthermore, it could also suggest that there are strong links in the mental lexicon of Turkish native users at the collocational level. It must also be underlined that the lexical items in the experiment were displayed in V+N order for a particular purpose and the fact that a priming effect was observed in spite of the irregular word order in Turkish provided in the priming experiment could be interpreted as the flexibility of Turkish in word order, especially in spoken production. To be more precise, in contrast with the strict word order in English for V+N collocations, Turkish language users are inclined to use both word orders (N+V vs. V+N) interchangeably very often during spoken production, although in the written production N+V order is strictly applied. Consequently, it can be assumed that the facilitation of processing of collocations in spite of the irregular word order presentation could be due to this informal use. An alternative explanation could be related to the fact that collocational priming is bidirectional. In other words, it is not only from the node to the collocate but also from the collocate to the node. Directionality reflects itself as forward and backward priming. The priming effect, which has been discussed throughout this thesis, means a facilitative effect of an earlier exposure. When related words are employed, a priming effect can be observed whichever word is used as prime or target (e.g. leg-arm). Namely, the association spreads in either direction; either from ‘leg’ to ‘arm’ or from ‘arm’ to ‘leg’. This is a phenomenon commonly observed for semantically related pairs (Jiang, 2012). To give an example from the current research, it can be tentatively claimed that the node ‘hata / *mistake*’ primes the collocate ‘yap- / *make*’ as strongly as the node ‘yap- / *make*’ primes the collocate ‘hata / *mistake*’, which was the word order employed in the first priming experiment. The fact that the same spreading activation is observed in collocations can be regarded as a contribution to the psycholinguistic literature. Last but not least, it must be noted that this research seems to extend Hoey’s claim (2005) about collocational priming by investigating a typologically different language, Turkish.

The output of the regression analysis revealed that part of speech and target word frequency were the statistically significant predictors of the mean response time in the first priming experiment. In other words, the fact that the lexical items were either in ADJ+N or V+N form and how frequent the target words were made a difference in the processing times of the participants. Furthermore, as is discussed earlier, the priming experiment showed that the participants of the experiment responded relatively faster to the V+N word combinations when compared with the ADJ+N lexical units. The output of the regression analysis suggesting that part of speech is an important predictor of response times (i.e. processing duration) appears to go hand in hand with the difference in the priming effect between the two groups of words. It must be underlined that the lexical items in each part of speech category revealed statistically significant priming effects, but the difference between the mean response times of V+N collocate and non-collocate items seems to be much bigger (23.2 milliseconds) than the difference between the mean response times of ADJ+N collocate and non-collocate items (13.0). One may assume based on the findings that nouns are processed faster when they are primed by a verb rather than an adjective in the Turkish language or that there are stronger links between nouns and verbs than between nouns and adjectives in the mental lexicon, which could result in a stronger spreading activation from a verb to a noun. It is possible to find a few attempts in the literature to explain the possible reasons for faster response times of V+N collocations rather than ADJ+N collocations although they are tentative claims and needs to be investigated further. For instance, Wolter and Gyllstad (2013), having a generative stance in their explanation, state that the way verbs are represented in the mental lexicon differ from the way adjectives are represented. To be more precise, they believe that verbs are represented in the higher nodes of the mental lexicon organization, which is likely to result in a processing advantage for them. Therefore, they are processed more easily and faster than adjectives that are processed as an integral component of an adjectival phrase and have stronger links with nouns considering the mean response times for the collocations in the priming experiment. This perspective can be observed in Generative Linguistics view and the researchers claim that this phenomenon could also be explained with a Chomskyan perspective although the idea of lexical priming is more related with usage-based models of language. It is further claimed in their research that V+N collocations are processed faster due to the fact that verbs are entrenched as the most meaningful units of a formulaic expression or a constituent and that they tend to be considerably more concrete and salient than adjectives, which is why they tend to form much more robust associations with their adjacent nouns and enjoy a processing advantage eventually.

Another explanation could be related to a methodological decision. The current research study selected the collocations for Experiment 1 with a particular aim in mind. The items were chosen by referring to the COCA and then cross-checked with the TNC output since the idea of conducting a priming experiment with Turkish only items to test collocational priming in Turkish emerged from the methodological concerns of the cross-linguistic priming study. That's why the collocations to be exploited in this experiment were the ones which were chosen primarily for Experiment 2 and 3. The chosen items had no case marking in an attempt to avoid any misleading results and that the piloting phase showed some problems regarding the lexical items with case marking compared to other items with no case marking. To exemplify, during filtering and frequency measuring phase, different forms of the verb 'ver- / *give*' were ignored and the frequency of the collocation 'öncelik ver- / *give priority*' were taken into account. That is, other possible forms 'vermesi (3rd person singular)', 'vermem (1st person singular)', 'vererek (by giving)' and so on were disregarded. Lack of lemmatization could be the reason for different processing times of V+N and ADJ+N collocations since adjectives are not lemmatized and they have only one form. Therefore, it can be concluded that uninflected forms of the verbs might have led to faster processing times for V+N collocations in the end.

Another important indicator of mean response times in the first priming experiment that needs further investigation was log-transformed target word frequency. One may claim that the effect of the target word frequency on processing times is an expected finding; however, because there is proof that collocational priming is taking place and collocational frequency is playing a significant role in the process, the continuing effect of single word frequency must be scrutinized to see its role within the big picture. It may suggest that both single word frequency and collocational frequency seem to influence collocational processing, on the whole and collocational priming, in particular. Although the regression analysis did not reveal any collocational frequency values as significant predictors of mean response time apart from *t*-score, which was not statistically significant but worth considering due to its almost significant value (β=-.085, *p*=.08), the correlation analysis indicated some statistically significant correlations between the frequency values and mean response times. It is commonly believed based on the empirical evidence in the literature that collocations are stored in the mental lexicon as chunks and the single parts of these lexical units are not retrieved separately during spontaneous speech since they are already activated as a whole and processed holistically. With the help of this automatic retrieval of the formulaic expressions rather than the single lexical items one at a time, native speakers produce the language more fluently and sound natural to other native speakers of the same community (Schmitt, 2010). Based on the comparison of regression analysis conducted separately for two different part of speech groups to unpack some of the patterns observed, it can be stated that when the priming effect is stronger, the influence of the target word frequency becomes weaker, for instance in V+N collocations. However, when it is weak, the influence of target word frequency overshadows collocational frequency, as in ADJ+N collocations. This analysis was carried out as an extension to the previously reported regression results in an attempt to scrutinize the effect of target word frequency, in particular.

On the whole, the results of this study indicate that target word frequency is still an important indicator of mean response time as well as collocational frequency in collocational priming and they appear to be responsible for the speed of lexical processing. Therefore, it should be employed as a complementary variable in other research as well and its role in collocational processing ought to be examined further. Wray (2012), who has discussed the issue of how native and non-native speakers process formulaic language in her research, surveys some of the studies (e.g. Conklin and Schmitt, 2008) which claim a holistic storage and retrieval of formulaic language. She addresses the reasons of the processing advantage of formulaic expressions and attemtps to approach the influence of repeated exposure on fused word strings from a critical point of view. She emphasizes the necessity to conduct interdisciplinary research to find stronger proof to address all these unsolved issues.

In addition to the regression, the correlation analysis conducted in order to discover possible relationships between the mean response time and frequency suggested that the mean response times in the first priming experiment and target word frequency as well as the frequency values (*t*-score, ΔP in both directions, and MI) revealed a negative correlation, which was regarded as a clear sign that frequency has a profound effect on collocational priming (i.e. how collocations are processed) in Turkish. It can also be suggested that the more frequent a collocational item is, the stronger priming effect it has or in other words, the faster it is processed. It is claimed that cognitive units appear to be entrenched and their activation becomes automated to the extent that they have been employed before or to the extent that language users encounter those units in language production. In addition, there is a correlation between the degree of entrenchment of a cognitive unit and its frequency of use (Langacker, 1987). It must also be underlined that it is not only lexical concepts that are entrenched with repeated exposure in the mental lexicon, but also collocational patterns (Biber et al., 1999).

Something that needs scrutiny is the fact that one of the frequency values exploited in this study and commonly employed in other related research revealing strong correlations, MI value, did not reveal a strong correlation though the numbers indicate a statistically significant correlation. This finding can be considered an unexpected outcome which is not in line with some earlier research (e.g. Wolter and Yamashita, 2017). It could also mean that owing to its potential weaknesses, which is true for many other frequency measures as well, MI value as a frequency measure is not good at predicting collocational processing speed on its own or there is no relationship between the MI value, which measures effect size and is sensitive to low frequency words, and collocational priming on the whole and the processing speed in a lexical decision task exploring collocations, in particular. As it is stated in earlier research as well, the MI value is likely to mislead research investigating frequency as one of the core variables and should be supported by other association measures, such as *t*-score (prioritizes adjusted frequency), ΔP (prioritizes directionality), log dice (prioritizes exclusivity) and so on to get a clearer picture of the influence of frequency on lexical processing (Gablasova, Brezina and Mcenery, 2017).

As an extended analysis considering the faster response times for V+N collocations, the writer conducted two separate correlation analyses (i.e. V+N vs. ADJ+N) to see if the mean response times for either part of speech group reveals stronger correlations with the frequency measures. The two distinct correlation results indicated that for the V+N collocations, there were more significant and stronger correlations. Statistically significant negative correlations between each frequency value and the mean response times were observed, and majority of them were either strong or medium correlations apart from the MI value which was weak. Target word frequency was also among the significant correlations, suggesting that it plays a role in the priming process. However, as to the ADJ+N collocations group, the same strong correlations cannot be detected. The only statistically significant negative correlations were between *t*-score and $\Delta P_{1|2}$ indicating collocational frequency and mean response times. Additionally, target word frequency also correlated negatively with the mean response times and this time a little stronger than its correlation within the V+N group. Similar to the interpretation made regarding the results of the regression analysis, one can deduce that V+N collocations were better at revealing the relationship between the collocational frequency values and the mean response times in the priming experiment, and thus it can be claimed that the correlation values for the V+N group are better at explaining the factors affecting the priming effect in Experiment 1.

Another issue to note with respect to the results of the correlation analysis is that ΔP values in both directions displayed statistically significant, strong negative correlations, which seems to suggest that there is a bidirectional interaction between the lexical items in the priming experiment, particularly for V+N collocations and they influence one another during automatic lexical processing and this interaction appears to contribute to collocational priming. To put it another way, the higher the ΔP values of the collocations for either direction were, the faster the participants responded to the lexical items and a stronger priming effect was observed. To give an example, the influence of the lexical item ‘işle- / *commit*’ on the item ‘cinayet / *murder*’ was as significant as the impact of the word ‘cinayet / *murde*r’ on the word ‘işle- / *commit*’ during the collocational priming process. To be more precise, both words appear to prime each other and ease lexical processing, which could result in faster response times in the experiment indicating a priming effect in the end. The merged data also showed that the same case could be true for some ADJ+N (e.g. ‘itici / *driving*’ – güç / force’ combinations although the interpretations should be tentative since the correlations computed for the two part of speech groups revealed some insignificant correlations.

In brief, based on the results of Experiment 1, it is claimed that there is collocational priming in Turkish (in L1 Turkish-L2 English bilingual mental lexicon) and frequency is playing a crucial role in collocational processing, and thus in collocational priming. Building on the assertions made regarding the reality of collocational priming in Turkish, a second experiment was designed aiming to investigate the issue from a cross-linguistic perspective. To this end, a corpus-assisted psycholinguistic experiment (i.e. Experiment 2), which include cognitive linguistic interpretations to explore cross-linguistic collocational priming in L1 Turkish-L2 English language users’ mental lexicon, was designed and conducted. In addition, the influence of frequency, congruence, part of speech, and exposure on collocational processing were scrutinized during the analysis. The numertical output of the experiment and initial interpretations of the findings, which could support the language non-specific lexical access hypothesis, approach the collocational priming paradigm from a different angle, and give important insight into the organization of bilingual mental lexicon, are provided in Section 4.2.3 and 4.2.4.

4.2.3. Experiment 2 (Cross-linguistic Collocational Priming Experiment in TR)

Although 41 participants attended the second priming experiment, the responses of 30 of them were included in the final analysis due to the cut-off values mentioned in the first experiment (i.e. 20% error rate). Additionally, the response times faster than 200 milliseconds and slower than 2000 milliseconds were trimmed from the overall data based on the recommendations in the literature (e.g. Jiang, 2012), reflecting the same concerns as the first experiment. As a result, 88.8% of the priming data were kept for the final analysis. The presentation in the following section is organized based on the word forms initially (All included, V+N, and ADJ+N, respectively). More elaborated figures and tables include the groups with various labels, such as V+N vs. ADJ+N, congruent vs. incongruent, L2-L1 vs. L1-L2 direction. The depiction starts from a broad perspective (i.e. all items included without any labels) and as the investigation narrows down, each label is added to the analysis to explore the issue more comprehensively. Following the graphs and tables, an overall discussion takes place explaining the most striking patterns and statistically meaningful results. The figures provide a general view of the mean response times in different lexical item groups and the tables present the mean response times of the bilingual participants in Turkey, having taken the cross-linguistic priming test, in different classifications and in more details. Figure 18 illustrates the comparison between the mean response times of collocate and noncollocate items when all the items are analysed as a whole, (i.e. without any labels or filtering).

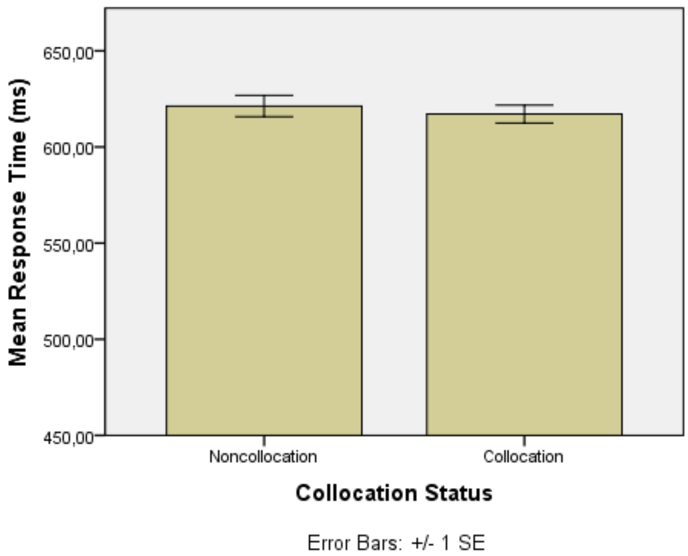

Figure 18 – Mean Response Times in Milliseconds (All items merged)

At first glance, a small gap between the mean reaction times of collocate (617.1 ms) and noncollocate items (621.2 ms) can be observed, but the difference is not statistically strong enough to claim that there is cross-linguistic collocational priming at this level. Figure 19 attempts to show the difference between the mean response times of congruent and incongruent collocations and noncollocations.

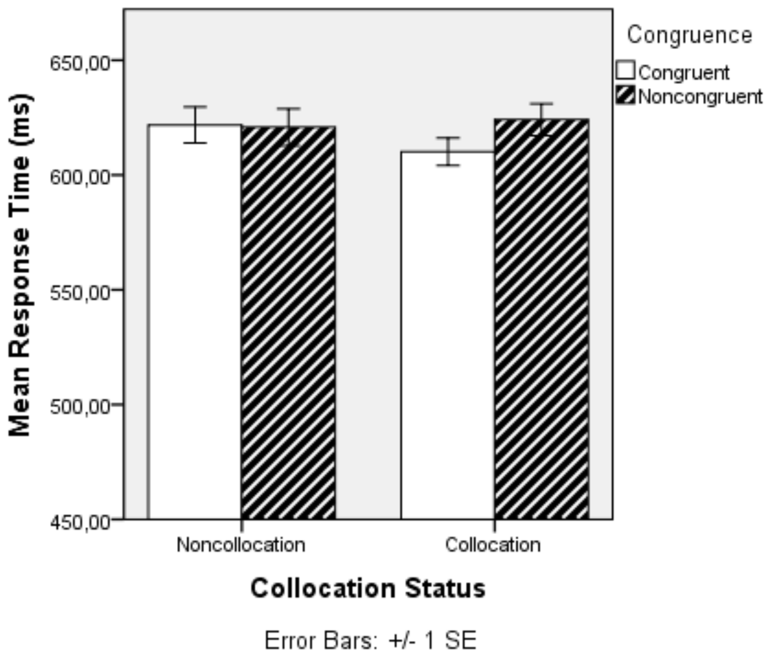

Figure 19 – Mean Response Times in Milliseconds (Congruence)

It can be understood from the figure that congruence has an effect on the reaction times, particularly when the presented target words are collocations. However, the difference between the mean response times of congruent collocate (610.1 ms) and congruent noncollocate items (621.7 ms) is not statistically significant to state that there is cross-linguistic collocational priming in congruent collocations. Figure 20 depicts a different aspect of the priming ouput, when the lexical items are classified according to their presentation direction.

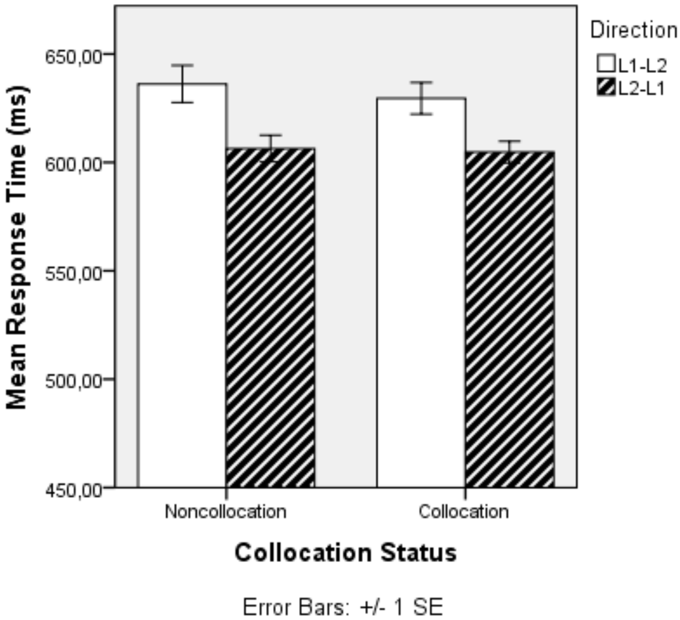

Figure 20 – Mean Response Times in Milliseconds (Direction)

The figure indicates that presentation direction appears to play a key role in how fast the target words are processed in the priming experiment. To be more precise, when the collocational items are presented in L2-L1 direction, the partcipants respond faster, which could be regarded as an expected result since the Turkish is the native language of the subjects. In terms of priming effect, it is not possible to make any statistical claims due to the small difference between the mean response times of collocate and noncollocate items in each direction. Table 18 provides a more elaborated view of the statistical output, including standard deviations and errors rates in each category.

Table 18 – Mean Response Times in Milliseconds, Standard Deviations in Parenthesis and Error Rates in Square Brackets

*Number of lexical items	Collocation RT	Non-collocates RT	*Priming Effect (millisecond)
All items 60 items	As a whole 617.1 (36.05) [0.7%]	As a whole 621.2 (43.12) [0.43%]	4.1 *p*=.46 r=.09
Congruence (30 items)	As a whole Congruent 610.1 (32.94) [0.5%]	As a whole Congruent 621.7 (43.02) [0.33%]	11.6 *p*=.21 r=.23
	As a whole Non-congruent 624.1 (38.19)	As a whole Non-congruent 620.8 (43.95)	NA
Language (30 items each)	As a whole L1-L2 629.5 (39.80) [0.70%]	As a whole L1-L2 636.1 (46.91) [0.52%]	6.6 *p*=.44 r=.14
	As a whole L2-L1 604.7 (27.21) [0.29%]	As a whole L2-L1 606.4 (33.51) [0.94%]	1.7 *p*=.82 r=.04

The overall conclusion that can be drawn from the analysis is that although there are differences between the mean response times of collocate and noncollocate items either when they are compared as a whole or with certain classifications, such as congruence and presentation direction, the values indicating statistical significance and the reported effect sizes are not strong enough to claim there is cross-linguitic collocational priming in the L1 Turkish-L2 English bilingual mental lexicon.

The figures and the table so far have provided the mean response times of all the collocate and non-collocate items without considering the part of speech classification, and then with some labels (i.e. congruence and presentation direction) integrated. The bar graphs have attempted to illustrate the overall difference between the response times for collocate and non-collocate items, whereas the table has elaborated the numbers by providing the standard deviations and the error rates in the priming experiment as well as the values indicating statistical significance and effect sizes. The following section filters the lexical items based on part of speech (V+N and ADJ+N) to investigate the potential effect of typology and focuses on ADJ+N collocations only. After presenting the mean response times for ADJ+N collocations and non-collocations in Figure 21, it narrows down the investigation by adding labels, such as congruence and presentation direction, displayed in Figure 22 and 23.

The figures attempt to depict the issue from a broader perspective and Table 19 provides more detailed results of the statistical analysis.

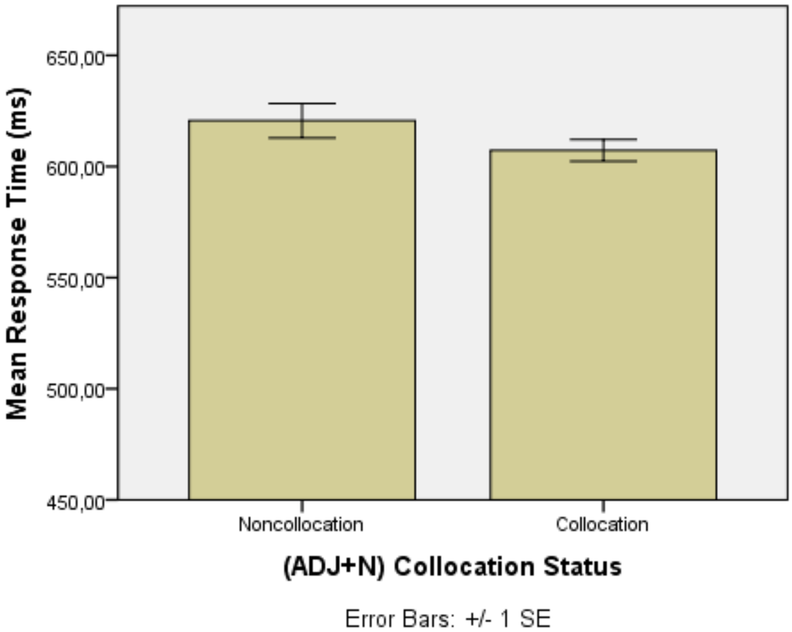

Figure 21 – Mean Response Times in Milliseconds (ADJ+N)

The output classified according to part of speech reveals that as opposed to the difference between the mean response times of collocate and noncollocate items when all the lexical items are merged in the analysis, the mean reactions times of ADJ+N collocations and noncollocations indicate a significant pattern in terms of cross-linguistic collocational priming. To be more precise, there is a statistically significant difference (p=.05) between the mean response times of ADJ+N collocate and noncollocate items, which could suggest that cross-linguistic collocational priming seems to be valid for ADJ+N collocations in the L1 Turkish-L2 English bilingual mental lexicon. Figure 22 considers congruence variable as well as part of speech in its representation.

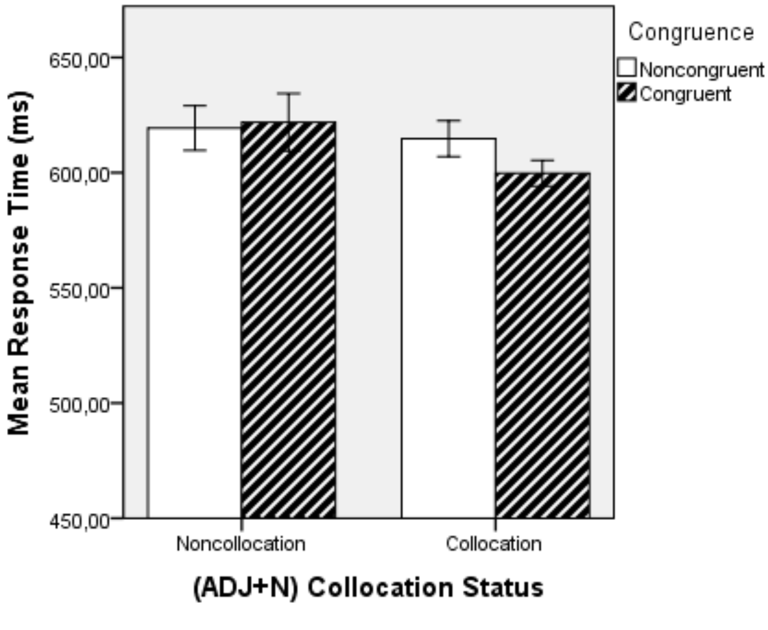

Figure 22 – Mean Response Times in Milliseconds (Congruence)

It becomes even clearer in this figure that ADJ+N collocations are processed relatively faster than noncollocate items within the same part of speech category, particularly when the exploited lexical items are congruent, creating a 22 millisecond gap between the two reaction times. Figure 23, on the other hand, takes the direction of the prime and target words (i.e. either in L1-L2 or L2-L1 direction) into account in its depiction.

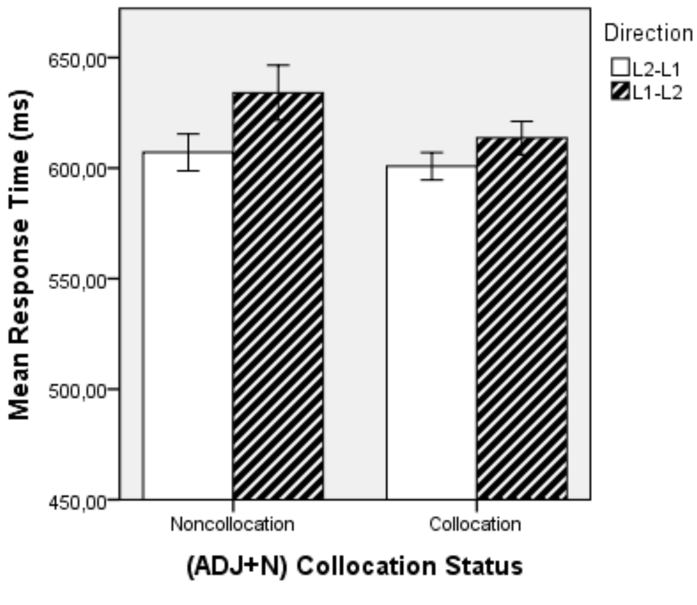

Figure 23 – Mean Response Times in Milliseconds (Direction)

The numbers indicate that while the collocate and noncollocate items presented in L2-L1 direction are processed faster by the L1 Turkish-L2 English bilinguals, the lexical items in L1-L2 direction reveals a more significant priming effect, creating a mean reaction time difference of more than 20.0 milliseconds. Therefore, one can state that both congruence and the direction of the presentation in the priming experiment appear to play an important role in cross-linguistic collocational priming, particularly for ADJ+N combinations. Table 19 illustrates the mean response times in each category in more details, including the standard deviations, error rates as well as significance values and effect sizes.

Table 19 – Mean Response Times in Milliseconds, Standard Deviations in Parenthesis and Error Rates in Square Brackets (ADJ+N)

*Number of lexical items	Collocation RT	Non-collocates RT	*Priming Effect (millisecond)
All items 30 items	**ADJ+N 607.2 (27.05) [0.42%]**	**ADJ+N 620.6 (42.62) [0.34%]**	**13.4 *_p_=.05 r=.30**
Congruence (15 items)	**ADJ+N Congruent 599.7 (21.85) [0.22%]**	**ADJ+N Congruent 621.8 (48.48) [0.41%]**	**22.1 *_p_=.05 r=.40**
	ADJ+N Non-congruent 614.7 (30.29) [0.7%]	ADJ+N Non-congruent 619.3 (37.54) [0.41%]	6.0 _p_=.66 r=.12
Language (15 items each)	ADJ+N L1-L2 613.6 (29.20) [0.55%]	ADJ+N L1-L2 634.0 (48.19) [0%]	20.4 _p_=.19 r=.34
	ADJ+N L2-L1 600.8 (23.99) [0.38%]	ADJ+N L2-L1 607.1 (32.41) [0.46%]	6.3 _p_=.45 r=.20
Language and Congruence (7-8 items each)	**ADJ+N L1-L2 Congruent 604.2 (24.77) [0.8%]**	**ADJ+N L1-L2 Congruent 637.0 (48.57) [0.3%]**	**32.8 *_p_=.05 r=.50**
	ADJ+N L1-L2 Non-Congruent 624.3 (31.95) [0.87%]	ADJ+N L1-L2 Non-Congruent 630.6 (51.40) [0.67%]	6.3 _p_=.77 r=.12
	ADJ+N L2-L1 Congruent 594.6 (18.43) [0.5%]	ADJ+N L2-L1 Congruent 604.4 (45.48) [1.1%]	9.8 _p_=.53 r=.26
	ADJ+N L2-L1 Non-congruent 606.3 (28.05) [0.8%]	ADJ+N L2-L1 Non-congruent 609.4 (17.73) [0.43%]	3.1 _p_=.73 r=.13

The table shows that as far as the ADJ+N collocations are concerned, the primary factors contributing to cross-linguistic collocational priming seem to be congruence and presentation direction. A further explanation in this table is with the regard to labels, congruence and direction, when the lexical items are filtered by both. It can be seen that when the collocations were congruent and they were presented in L1-L2 direction, the bilingual participants responded comparatively faster. The difference between the mean reaction times of congruent collocate and non-collocate items in L1-L2 direction were statistically significant at the level of p=.05 with a large effect size (r=.50). Although the participants responded faster to the items when they were presented in L2-L1 mainly due to the fact that the target word was in their native language, no priming effect could be observed based on the difference between the mean reaction times of collocate and noncollocate items. Figure 24 sheds light on the patterns observed in V+N collocations.

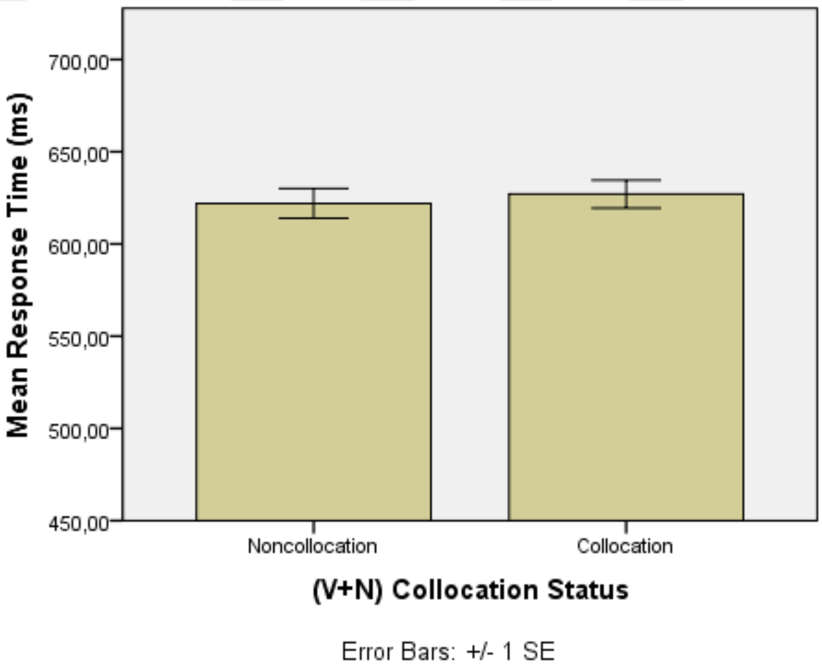

Figure 24 – Mean Response Times in Milliseconds (V+N)

As opposed to what was observed in the ADJ+N group, a possible priming effect cannot be seen in this overall depiction. The mean response times of collocate and noncollocate items were rather close to each other, the reason of which could be attributed to the different word order in Turkish and English at first glance. To be more precise, the fact that nouns come before verbs (as in '*hata yap-*') in Turkish, whereas verbs precede nouns in English (as in '*make a mistake*') could have resulted in the lack of priming effect. Figure 25 attempts to explain the scenario when congruence as well as part of speech was taken into account by providing mean reaction times of the related lexical items.

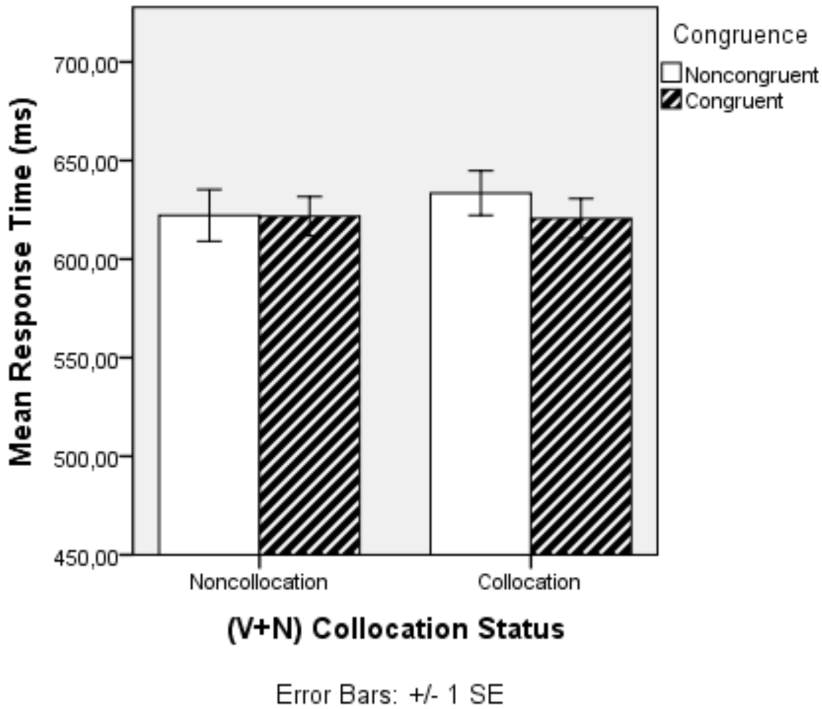

Figure 25 – Mean Response Times in Milliseconds (Congruence)

When the congruence variable was taken into account in the V+N priming analysis, the overall picture did not appear to change. While the participants responded a little faster to the noncongruent noncollocations than their collocate counterparts, they reacted to the congruent collocate and noncollocate items at approximately the same speed. Therefore, it can be tentatively stated that congruence does not play a role in how V+N collocations are processed cross-linguistically, particulary when the languages in question are typologically distinct. As in the ADJ+N group, the writer attempted to analyse the effect of presentation direction and look into the existence of priming asymmetry for V+N collocations. Figure 26 displays the analysis of the mean response times of V+N collocate and noncollocate items when they are labelled as either L1-L2 or L2-L1 direction.

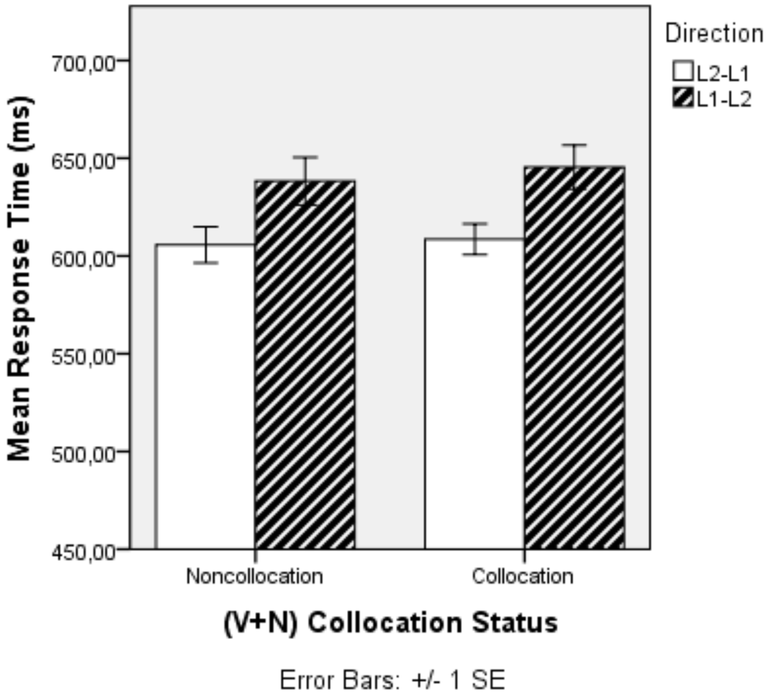

Figure 26 – Mean Response Times in Milliseconds (Direction)

Similar to the observations made for the ADJ+N items, when the V+N items were presented in L2-L1 direction, the participants responded faster to the collocate and noncollocate items since the target words were in their native language and it was obvious that L1 words were processed faster than L2 words even if the subjects were advanced L2 English users. When it comes to the gap between the collocate and noncollocate items in both situations, which was the core investigation for the current research, no priming effect could be detected as the reponse times were close to each other in both instances. Thus, one can state that the direction (i.e. L2-L1 vs. L1-2) of the prime and target words in Experiment 2, where the focus of investigation is Turkish and English, does not affect the processing times of V+N collocate and noncollocate items. Table 20 shows some details, such as statistical significance and effect sizes of the mean reaction time differences reported with the help of the figures so far. In addition, it provides a further analysis of the mean response times of the collocate and noncollocate items when they are both filtered by congruence and presentation direction labels at the same time.

Table 20 – Mean Response Times in Milliseconds, Standard Deviations in Parenthesis and Error Rates in Square Brackets (V+N)

*Number of lexical items	Collocation RT	Non-collocates RT	*Priming Effect (millisecond)
All items 30 items	V+N 627.0 (41.34) [0.35%]	V+N 621.9 (44.33) [0.54%]	NA
Congruence (15 items)	V+N Congruent 620.6 (39.20) [0.52%]	V+N Congruent 621.7 (38.52) [0.84%]	1.1 *p*=.92 r=.02
	V+N Non-Congruent 633.4 (43.77) [1.0%]	V+N Non-Congruent 622.2 (50.86) [0.65%]	NA
Language (15 items each)	V+N L1-L2 645.46 (43.44) [0.88%]	V+N L1-L2 638.28 (47.19) [0.66%]	NA
	V+N L2-L1 608.6 (30.44) [0.42%]	V+N L2-L1 605.6 (35.71) [1.73%]	NA
Language and Congruence (7-8 items each)	V+N L1-L2 Congruent 642.4 (27.93) [0,85%]	V+N L1-L2 Congruent 631.4 (43.10) [0.92%]	NA
	V+N L1-L2 Non-Congruent 648.91 (58.88) [0.7%]	V+N L1-L2 Non-Congruent 646.07 (53.82) [0.45%]	NA
	V+N L2-L1 Congruent 595.6 (36.24) [0.43%]	V+N L2-L1 Congruent 610.6 (32.01) [1.3%]	15.0 *p*=.52 r=.27
	V+N L2-L1 Non-Congruent 619.93 (20.32) [0.34%]	V+N L2-L1 Non-Congruent 601.37 (40.33) [0.14%]	NA

*The significance level is .05

In addition to what has been reported so far, the *p* values and effect sizes also indicate that a cross-linguistic collocational priming does not seem to exist for V+N collocations in the L1 Turkish – L2 English bilingual mental lexicon. However, a further analysis reported in the table suggests that considering the difference between the mean response times of congruent collocate and noncollocate items (15 milliseconds), the highest possibility of observing cross-linguistic collocational priming was for congruent V+N collocations in L2-L1 direction, athough the statistical significance and the effect size fail to support the assumption. A bigger number of collocational items could have revealed a stronger pattern and a statistically significant difference.

When the analyses so far are taken into consideration, on the whole, a typology effect due to different word order in Turkish and English can easily be observed as the major priming impact can be seen in ADJ+N combinations only. Different typologies of Turkish and English seem to interrupt or slow down the priming process in the V+N combinations in particular. One can state that there is cross-linguistic collocational priming in ADJ+N combinations, but not in V+N collocations based on the statistical difference between the response times of collocate and non-collocate items at the level of p=.05. It can be claimed statistically that the results seem to be generalizable and have a medium effect size of r=.30, which indicates that the pattern observed can be considered important and is worth investigating further. Another striking finding is that congruence plays an important role in the processing of ADJ+N collocations cross-linguistically. In other words, one can detect a priming effect in congruent ADJ+N collocations in the light of the statistically significant difference between the response times of collocate and non-collocate items, $p=.05$ with a medium effect size of r=.40. However, the same priming effect cannot be seen in incongruent items. With regard to the direction of priming, certain differences can be spotted between the collocate and non-collocate items, which indicated a cross-linguistic priming effect. For instance, when the ADJ+N items were tagged as L1-L2 as well as congruent, the gap between the response times appears to widen (32.8 milliseconds) and the difference between response times of corresponding items is statistically significant at the level of p=.05. In addition to that, the biggest gap between the V+N collocations and non-collocations is reflected in the L2-L1 congruent category (15.0 milliseconds), although the presence of a priming effect cannot be claimed in this instance owing to a lack of statistical proof. There is obviously an effect of the direction of the presentation and congruence on the processing times of the collocations cross-linguistically, but the numbers are not strong enough to make serious empirical assertions for V+N collocations.

In addition to comparing the mean response times of collocate and non-collocate items both in general and with some filters in Experiment 2, correlation and regression analyses were conducted to explore the relationship between the target variables and the mean response time and look into the indicators of processing speed. Section 4.2.3.1. reports the results of the model.

4.2.3.1. Experiment 2 - Regression & Correlation

In an attempt to investigate the influence of frequency, congruence and typology (i.e. different word order) on cross-linguistic collocational priming, a multiple regression analysis was conducted. Mean response times were the dependent variable and *t*, MI, Delta P values in Turkish and English, target word frequency, congruence, part of speech (POS), collocation vs. non-collocation, language (L2-L1 vs. L1-L2) were independent variables. So the regression plan was as follows:

Outcome	*Predictors*
Mean response time of collocate and noncollocate lexical items	Collocation vs. non-collocation
	POS (ADJ+N vs. V+N)
	Congruence
	Language (L2-L1 vs. L1-L2)
	Target word frequency
	MI (frequency both in English and Turkish)
	T-score (frequency both in English and Turkish)
	Delta P (multidirectional frequency both in English and Turkish)

The multiple regression analysis of the response times by Turkish L1 and English L2 bilinguals in Experiment 2 reflected the numbers in Table 21.

Table 21 – Regression Results (TR)

Model	***b***	***SE b***	**Beta**
Constant	761.260	33.505	
POS	-5.993	6.839	-.076
Collocation vs Non-collocation	-33.669	29.037	-.427
Congruence	11.286	9.496	.237
Language (L1-L2 vs. L2-L1)	-104.302	21.299	-1.321**
Target word frequency	-26.930	7.272	-1.024**
TR *t* score	1.440	1.103	-.193*
TR MI score	.780	3.362	.072
TR $\Delta P_{1\|2}$	12.506	27.072	.070
TR $\Delta P_{2\|1}$	-2.462	27.251	-.014
ENG *t* score	-.376	.401	-.162
ENG MI score	.450	4.343	.043
ENG $\Delta P_{1\|2}$	-82.599	154.439	-.080
ENG $\Delta P_{2\|1}$	116.140	170.430	.083

Note for model: R=.543[a] and R^2=.295 (p<.001)
* The significance level is p<.05
** The significance level is p<.01

A multiple regression analysis was employed to explore whether part of speech, collocation and non-collocation status, congruence, the direction of the presentation, *t*, MI and ΔP scores in both languages and target word frequency can significantly predict participants' response times in Experiment 2. The results of the analysis indicated the predictors explained 29.5% of the variance (R^2=.295, F=3.40, *p*<.001) for the model. The numbers suggested that the variable, language (L1-L2 vs. L2-L1) significantly predicted the response times (β=-1.321, *p*<.001) of the subjects in the priming experiment. In addition to that, target word frequency (β=-1.024, *p*<.001), *t*-scores in Turkish (β=-.193, *p*<.05) revealed themselves as significant indicators of mean response time in the experiment. Once the initial linear analysis was completed, the researcher did some additional inquiry to explore the potential relationship of individual independent variables with the dependent variable, response time. Table 22 displays the results of the correlation analysis and highlights the significant correlations as well as the insignificant ones.

Table 22 – Correlation Results (TR)

	Mean Response Times
Language (L1-L2 vs. L2-L1)	-.346** / r_{pb}= -.33**
Target word frequency	-.210**
Congruence	.006 / r_{pb}= .00
POS	-.134* / r_{pb}= -.13*
ENG $ΔP_{1\|2}$	-.173*
ENG $ΔP_{2\|1}$	.047
ENG *t* score	-.120
ENG MI score	-.066
TR *t* score	-.062
TR MI score	-.044
TR $ΔP_{1\|2}$	-.018
TR $ΔP_{2\|1}$	-.062

**Correlation is significant at the .01 level
*Correlation is significant at the .05 level

It can be deduced from the numbers that the strongest negative correlation was between the directions of the presentation and the mean response times, which could also be predicted based on the regression data (*r*=-.346/r_{pb}=-.33, *p*.01). Another noteworthy medium negative correlation was between the target word frequency values and response time in the priming experiment (*r*=-.210, *p*.01). Namely, the higher the frequency of the target lexical item, the faster the participants responded, which could signify a contribution to the priming effect. Furthermore, one can observe comparatively weaker negative correlations between mean response times and $\Delta P_{1|2}$ score (r=-.173, p.05) and mean response times and part of speech (r=-.134/r_{pb}=-.13, p.05). Therefore, it is possible to claim that whether the collocation was presented in L1-L2 or L2-L1 in the priming experiment and the target word frequency either in Turkish or English depending on the presentation direction had the strongest relationship with the mean response times, which could imply that the variables, the presented language and target word frequency, could have a partial impact on cross-linguistic collocational priming although this relationship does not provide pure evidence of causation. Additionally, although not the same size relationship can be observed in the findings, the significant negative correlations could denote that $\Delta P_{1|2}$ in English and part of speech appeared to be related to the response times of the participants and might have affected cross-linguistic collocational priming. The negative correlation in the continuous data in particular seems to indicate that as $\Delta P_{1|2}$ values in English go up, the mean response times go down or vice versa. In other words, the more frequent the English lexical items in Experiment 2 based on the numbers provided by $\Delta P_{1|2}$ values are, the faster the participants respond, which could be regarded as important in explaining their potential effect on cross-linguistic collocational priming.

As an extended analysis, the researcher computed a separate correlation analysis for ADJ+N and V+N collocations considering the significant priming effect observed in ADJ+N collocations only in the previous section. The idea was that there may be stronger correlations between the mean response times of ADJ+N collocations and frequency values because of the priming effect observed earlier. On the other hand, it was assumed that due to a lack of priming effect, V+N collocations would reveal weaker or insignificant correlations. To this end, the data was split into two groups (ADJ+N – V+N) and a correlation analysis was computed. Table 23 presents the correlations in two different columns for comparative purposes.

Table 23 – Correlation Comparing AD+N and V+N Collocations

	Mean Response Times (ADJ+N)	**Mean Response Times (V+N)**
Language (L1-L2 vs. L2-L1)	-.278** / r_{pb}= -.26**	-.411** / r_{pb}= -.40**
Target word frequency	-.230**	-.207*
Congruence	-.106 / r_{pb}= -.11	.100 / r_{pb}= .10
ENG $\Delta P_{1\|2}$	-.224*	-.065
ENG $\Delta P_{2\|1}$	.089	.028
ENG *t* score	-.147	-.041
ENG MI score	-.190*	.074
TR *t* score	-.090	-.033
TR MI score	-.209*	.098
TR $\Delta P_{1\|2}$	-.218*	.210*
TR $\Delta P_{2\|1}$	-.051	-.046

**Correlation is significant at the .01 level
*Correlation is significant at the .05 level

The results indicated that there were stronger negative correlations between the mean response times of ADJ+N collocations in particular, which revealed a significant cross-linguistic priming effect, and the frequency values; $\Delta P_{1|2}$ in both languages (*r*=-.224, *p*.05 and *r*=-.218, *p*.05 for ADJ+N) and MI score in Turkish (*r*=-.209, *p*.05) and English (*r*=-.190, *p*.05). The findings seem to support the assumptions regarding a stronger relationship between the reaction times of ADJ+N collocations and frequency values. The only significant correlation for the V+N group was between the mean reponse time and $\Delta P_{1|2}$ in Turkish (*r*=-.210, *p*.05). The presentation direction (*r*=-.278/r_{pb}=-.26, *p*.01 and *r*=-.411/r_{pb}=-.40, *p*.01, respectively) and target word frequency (*r*=-.230, *p*.01 and *r*=-.207, *p*.01, respectively) still play an important role in reaction times in both groups. The interpretations of this difference are scrutinized in the discussion section.

4.2.4. Experiment 2 – Initial Discussion of the Findings

Research Question 3
Is it possible to state that symmetric and asymmetric cross-linguistic collocational priming exists in the bilingual mental lexicon?
Research Question 4
Do the syntactic-order based differences of English and Turkish influence bidirectional collocational priming?

When it comes to the findings of Experiment 2 investigating cross-linguistic priming, it can be concluded that there is cross-linguistic collocational priming in

ADJ+N combinations in the bilingual (Turkish L1-English L2) mental lexicon. The fact that no priming effect could be detected on the whole for V+N collocations can be interpreted as a possible typology effect. To be more precise, since the word order in Turkish is just the opposite of English when the V+N combinations are concerned, lexical processing of the V+N items might have taken longer than ADJ+N items. Nouns come before verbs in Turkish, which could have made the cross-linguistic processing of those collocations more difficult and placed more processing burden on the participants.

An issue that was discussed for Experiment 1 was the bidirectionality of collocational priming. That is to say, the node primes the collocate as much as the collocate primes the node. The ΔP values confirmed the bidirectional effect of the lexical units of a collocation on one another within the same language. It must be underlined that the term also refers the bidirectional influence of the two languages of a bilingual. The direction of the priming presentation, which could indicate a possible bidirectional interaction, was also a variable scrutinized during the analysis in Experiment 2. The findings suggested that as far as the ADJ+N collocations, which revealed a significant priming effect, are concerned, although the participants responded faster to the target words when they are in L1 and when the prime was in L2, which was considered as natural due to the processing benefit of the native language, the biggest gap between the mean response times of collocate and non-collocate items were observed in the L1-L2 direction, ADJ+N congruent items in particular. The strong impact of the presentation direction can also be detected in the regression analysis, reflecting the language variable as a significant indicator of mean response time as well as target word frequency either in English or Turkish depending on the direction of the presentation. This could be ascribed to stronger syntagmatic links in L1 to L2 direction, which is in line with other studies (e.g. Jiang and Forster, 2001; see also Jiang, 2012 for a review) exploring paradigmatic lexical links and claiming asymmetry in cross-language priming. Though the fact this asymmetry was also observed in cross-linguistic collocational processing in the bilingual mental lexicon is a unique contribution of this study to the literature.

Research Question 5
To what extent does (a) collocational frequency (b) the relationship between congruent vs. non-congruent L1 and L2 collocations, if any, play a role in the bidirectional activation of L1 and L2 collocations?

Another important issue scrutinized in the analysis was the possible contribution of frequency to the mean response times. The regression analysis computed in addition to the correlation analysis indicated that *t*-scores in Turkish in particular appeared to be significant indicators of the mean response times in Experiment 2. In addition to the collocational frequency measures, target word frequency seemed to have a key role in the mean response times. In other words, the more frequent the target word was, the faster the participants responded, which is in line with the emergentist view of language acquisition underlying the importance of frequency for the order of acquisition and the how entrenched words become in the internal lexicon if they are more frequent and salient (Kemmer and Barlow, 2000). Although the target frequency relationship does not directly say much about the collocational processing, it can still be regarded as an important finding as it contributes to the existing literature stressing the importance of word frequency for language acquisition models. In addition, it may also underline the fact that frequency of single lexical items still matter while processing collocations in the bilingual mental dictionary, particularly for those bilinguals who are in the second phase of the Jiang's Lexical Representation in L2 Model (2000), which will be discussed further in the overall discussion section. This could also indicate that L1 Turkish - L2 English users having a certain degree of proficiency tend to store lexical combinations as single lexical items or decompose them as opposed to the native speakers of each language, who are expected to store collocations and formulaic phrases as chunks or bundles. As far as the regression and correlation analyses conducted for the first and second experiments are concerned, the effect of frequency for the Turkish only lexical items in Experiment 1 and the same effect for the cross-linguistic items in Experiment 2 seem to differ to a certain extent. Although both analyses revealed significant correlations, the differing strengths of these relationships indicate that the influence of frequency on processing times and collocational priming in the first and second language appears to be dissimilar. Wray (2002) posits that native speakers and non-native speakers tend to process formulaic expressions differently. While native speakers store and retrieve formulaic expressions as chunks, non-native speakers are inclined to store single lexical units and retrieve single words to form collocations in spontaneous speech. As they gain proficiency, the effect of collocational frequency may increase, but it is hard for them to process formulaic expressions as native speakers do. The participants of the second experiment who are advanced users of English and considered as unbalanced bilinguals could be benefitting from collocational frequency to a certain extent. However, it must be admitted based on the findings that single word frequency is still playing a crucial role in collocational processing in the second cross-linguistic experiment and Wray's assertions could be valid up to a point in terms of the current findings. The researcher conducted an extended analysis comparing the correlation results of the two-different part of speech groups (i.e. ADJ+N and V+N) in an attempt to detect the effect of frequency on the mean reaction times of ADJ+N collocations, in particular, which revealed a significant priming effect as opposed to insignificant priming effect observed in the mean response times of V+N collocations. The results validated the assumptions. When the data was split into two separate part of speech groups, stronger correlations between the mean response times of ADJ+N collocations and the exploited frequency values were observed. To be more precise, when the two part of speech groups were merged in the analysis, the only negative weak correlation was between the frequency values, $\Delta P_{1|2}$ in English and mean response time. However, the correlation for the ADJ+N collocations indicated considerably more significant negative correlations as opposed to the V+N collocations with a negative correlation with target word frequency and $\Delta P_{1|2}$ in Turkish only. For instance, $\Delta P_{1|2}$ in English and Turkish and MI scores in English and Turkish correlated inversely with the mean reaction times of the ADJ+N collocations, which seems to indicate a possible typology effect stemming from syntactic-order based differences of the two languages emphasized earlier.

As for another important variable for the study, congruence appears to play an important role in the way collocations are processed cross-linguistically. The conclusion can be drawn based on the significant priming effects found in congruent ADJ+N collocations as opposed to the non-congruent items, the former reflecting a 22.1 millisecond difference between the mean response times of the collocate and the non-collocate items. Though it does not show a significant priming effect due to the small number of the lexical items tested, the difference between the mean response times of the congruent V+N collocates and non-collocates (15.0 ms) presented in L2-L1 direction is worth mentioning considering the small differences between the items in other categories. It is obvious that congruence facilitates the processing of V+N collocations and the fact that the presented word combinations were congruent in Turkish and English triggers priming to a certain extent, though not strong enough to make robust claims. Another issue to note is that when the mean response times of ADJ+N and V+N collocations within a certain category are taken into account, it can be observed that congruence plays a major role in processing as the mean response times of the congruent items are considerably lower when compared with the mean response times of the incongruent ones. Although the comparison between the unrelated items, which are congruent and incongruent items in separate groups, was not the main investigation in the current study, those differences were thought to be worth mentioning and interpreting. It can be tentatively deduced based on the mean response times that it is easier for the bilinguals to access congruent collocations in Turkish and English.

This finding can be considered in line with previous research (e.g. Yamashita and Jiang, 2010; Wolter and Yamashita, 2014) discussing processing advantage for congruent collocations. The studies also state that congruent collocations are easier to access during spontaneous speech and seem to affect fluency. On the other hand, because they take longer to process, incongruent ones might hinder processing and are likely to cause delays in production and result in collocational errors since wrong lexical items are activated and selected. The same influence that were detected in the lexical production stage in previous studies was observed at the lexical activation stage in the current study.

Faster response times in the congruent collocations and the significant priming effects detected between the mean response times of the congruent collocate and non-collocate items can also be explained by age of acquisition and/or order of acquisition. There are convincing claims saying that acquisition is facilitated when L1 and L2 correspond, both for single lexical items (Jiang, 2000) and for collocational items (Wolter, 2006). In this regard, one can assume that congruent L2 collocations tend to be acquired earlier than incongruent ones and thus, this quality of congruent word combinations may result in faster response times in the experiment which reflects a significant priming effect. In addition, it can also be the case based on the results of the current study that congruence in combination with high frequency facilitates lexical processing and have a key role in cross-linguistic collocational priming. However, Yamashita and Jiang (2010) states the frequency of congruent collocations may not be as important as incongruent ones for bilinguals to comprehend and store in the L2 internal lexicon since L2 users accept congruent collocations based on their L1 counterparts.

4.2.5. Experiment 3 (Cross-linguistic Collocational Priming Experiment in the UK)

An experiment employing the same lexical items chosen for the second priming experiment was designed and conducted in an attempt to investigate the possible relationship between language exposure and collocational processing at the cross-linguistic level. With this aim in its agenda, the third experiment was conducted with the help of 13 L1 Turkish – L2 English bilingual subjects, who had been living in the UK setting for at least two years when they took the priming test. The same cut-off values applied in experiment one and two were also employed in this experiment, leaving 91.7% of the trimmed priming data for the final analysis. Figure 27 indicates the results of Experiment 3 set in the UK when all the items are merged in the analysis and no lexical classifications are applied.

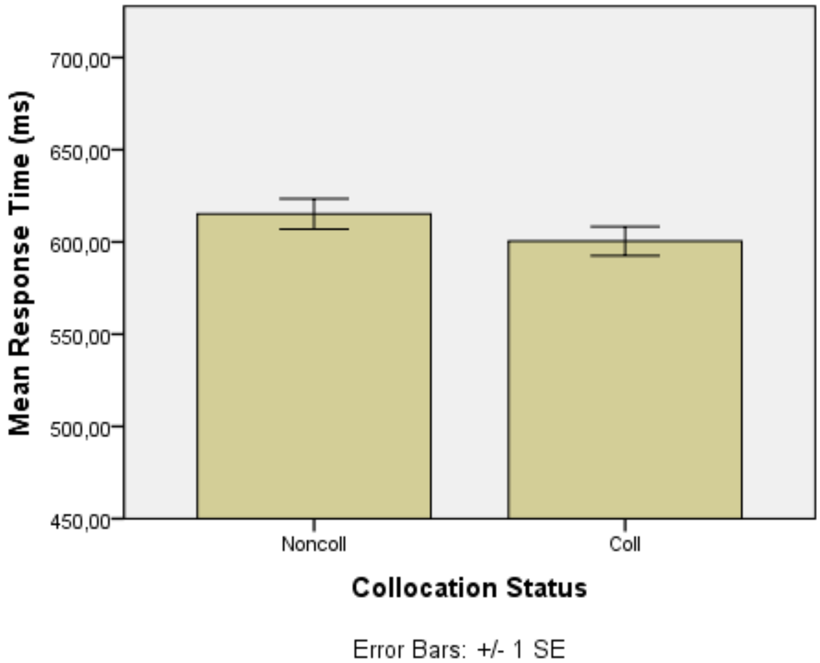

Figure 27 – Mean Response Times in Milliseconds (All items merged)

The difference between the mean response times of collocate and noncollocate items on the whole reveals approximately a 15 millisecond gap, which could indicate a possible priming effect when all the lexical items are taken into account in the analysis. However, the statistical values do not reflect a significant priming effect, though the gap between the mean response times reported above seems to be a humble indication of collocational interaction in the mental lexicon during cross-linguistic lexical processing. Figure 28 looks at the issue from a congruence perspective.

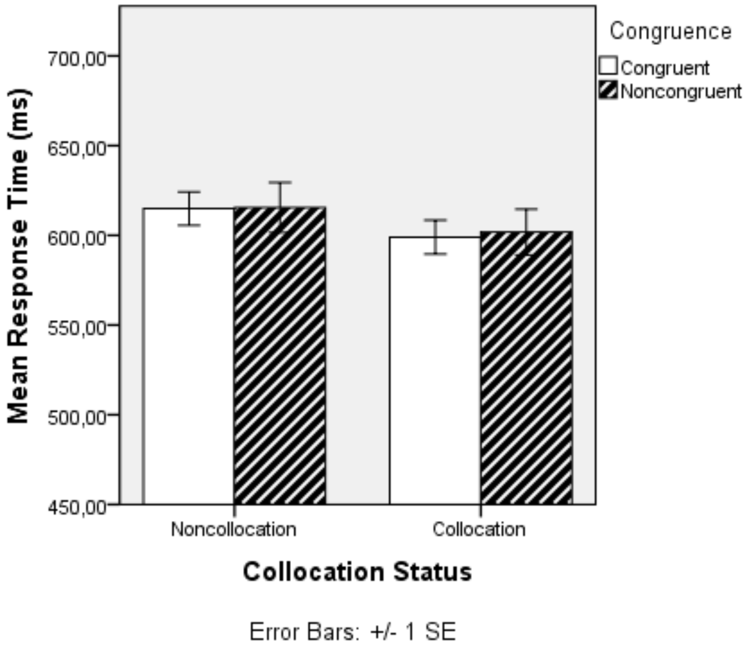

Figure 28 – Mean Response Times in Milliseconds (Congruence)

When congruence was taken into consideration, it can be observed that the subjects responded to both congruent and noncongruent collocations faster than the noncollocations of the same sort. However, because the mean response times of the two instances are very similar, it is not possible to state that congruence is playing a role in cross-linguistic collocational processing. The fact that both congruent and noncongruent collocations are processed faster than congruent and noncongruent noncollocational items in the third experiment could indicate a potential difference in lexical processing of the subjects in Experiment 2 (in Turkey) and Experiment 3 (in the UK) resulting from their different language exposure experiences. Figure 29 shows the mean response time differences when the direction of the presentation is considered.

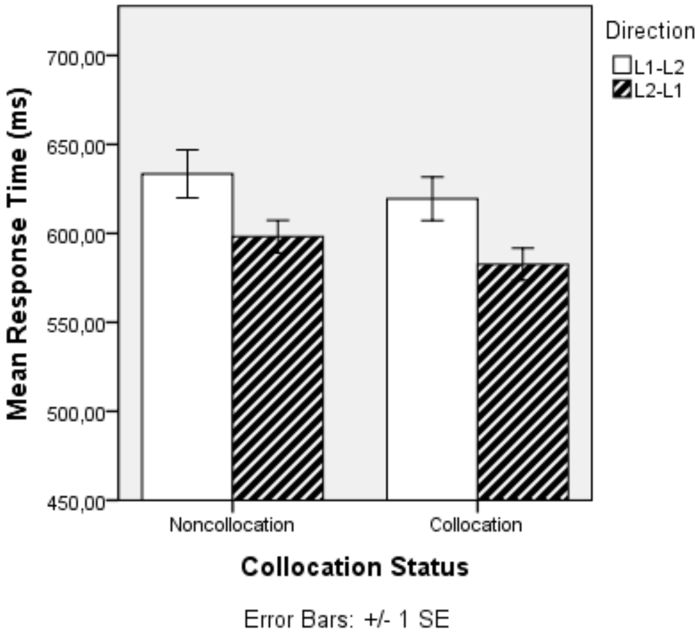

Figure 29 – Mean Response Times in Milliseconds (Direction)

A similar trend observed in the second experiment can also be detected in the third experiment. To be more precise, collocations and noncollocations in L2-L1 direction were processed faster than the ones in L1-L2 direction, indicating an obvious processing advantage of the native language. When it comes to the mean reaction time difference between the collocate and noncollocate items, a 15 millisecond difference can be observed in both directions; however, the observed patterns are not statistically significant to claim that there is a priming effect. Table 24 expounds upon what has been reported so far regarding the differences between the mean response times and summarizes some statistical details.

Table 24 – Mean Response Times in Milliseconds, Standard Deviations in Parenthesis and Error Rates in Square Brackets

*Number of lexical items	Collocation RT	Non-collocates RT	*Priming Effect (millisecond)
All items 60 items	As a whole 600.3 (58.94) [1.1%]	As a whole 615.1 (62.14) [0.68%]	14.8 *p*=.09 r=.23
Congruence (30 items)	As a whole Congruent 598.9 (50.10) [0.65%]	As a whole Congruent 614.8 (49.24) [0.43%]	15.9 *p*=.18 r=.25
	As a whole Non-congruent 601.7 (67.54) [0.49%]	As a whole Non-congruent 615.4 (73.76) [0.22%]	13.7 *p*=.29 r=.20
	As a whole L1-L2	As a whole L1-L2	14.0

Language (30 items each)	619.4 (63.57) [0.68%]	633.4 (70.04) [0.46%]	*p*=.18 r=.26
	As a whole L2-L1 582.6 (48.91) [0.37%]	As a whole L2-L1 598.1 (49.07) [0.74%]	15.5 *p*=.27 r=.21

On the whole, one can deduce that when all the collocations are merged in the analysis, regardless of their part of speech, the difference between the mean response times of collocate and noncollocate items is not statistically significant, although the differences reported in milliseconds could make us tentatively assume that collocational links appear to affect cross-linguistic collocational processing to a certain extent and a further experiment with relatively more lexical items has the potential to yield more meaningful and significant results.

The following section considers the lexical items based on part of speech (V+N and ADJ+N) to explore the possible influence of typology. After reporting the mean response times for ADJ+N collocations and non-collocations, it narrows down the investigation by adding labels, such as congruence and presentation direction to look into the existence of cross-linguistic collocational priming and contributing factors. The figures depict the issue from a broader angle and the table gives more detailed results of the statistical analysis. Figure 30 summarizes the overall picture for ADJ+N collocations.

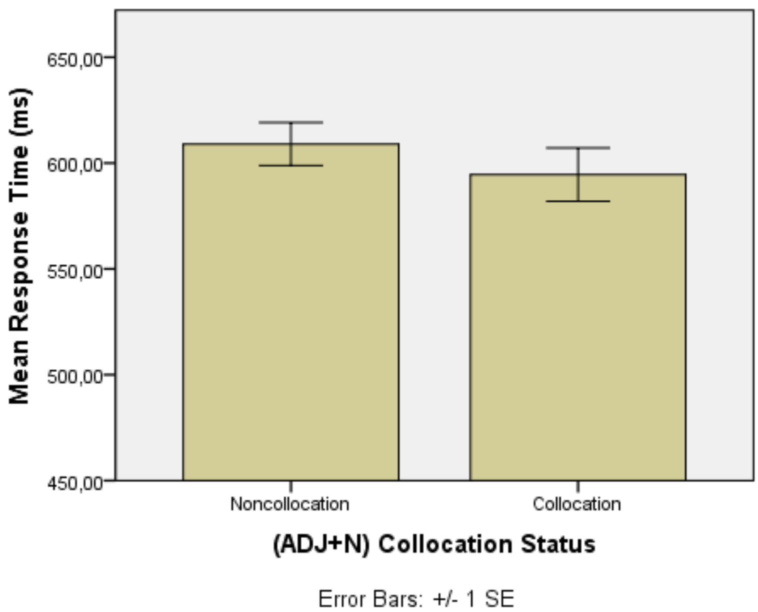

Figure 30 – Mean Response Times in Milliseconds (ADJ+N)

The overall analysis output scrutinizing ADJ+N word combinations reveals that the collocational items are processed faster than the noncollocational items by the participants in the UK in Experiment 3, creating a 14 millisecond mean reaction time difference between the two item groups. Although it can be said that collocational links are playing a role in cross-linguistic collocational processing, the statistical values do not allow to make strong claims regarding a potential priming effect. Figure 31 summarizes the issue from a different angle by elaborating the difference between congruent/noncongruent collocate and noncollocate items.

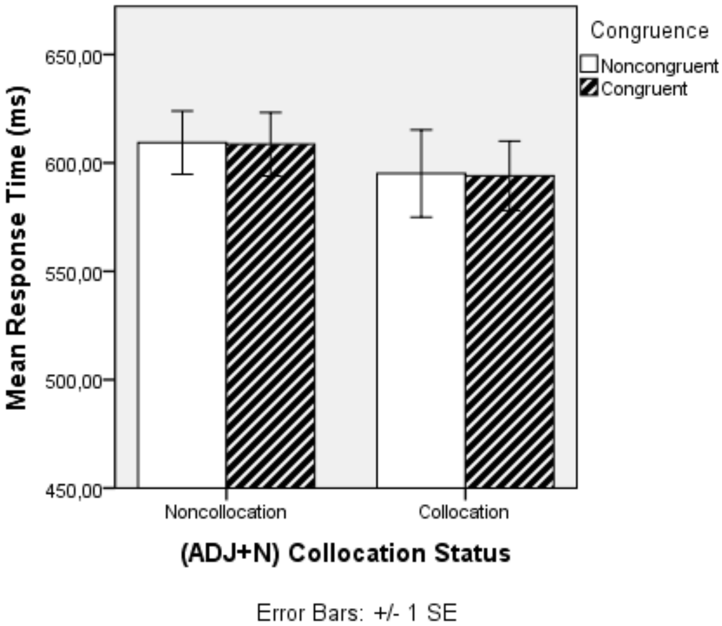

Figure 31 – Mean Response Times in Milliseconds (Congruence)

At first glance, an influence of collocational links can be seen in the output as it is shown that the collocations are processed faster than noncollocations. The difference between the mean reaction times of congruent collocate and noncollocate items appears to be similar to the difference between the mean reaction times of noncongruent collocate and noncollocate items. Therefore, it can be deduced that an effect of congruence cannot be observed in cross-linguistic collocational processing in Experiment 3. Figure 32 indicates the mean reactions times considering the presentation direction of the lexical items and summarizes the processing differences between the collocate and noncollocate items.

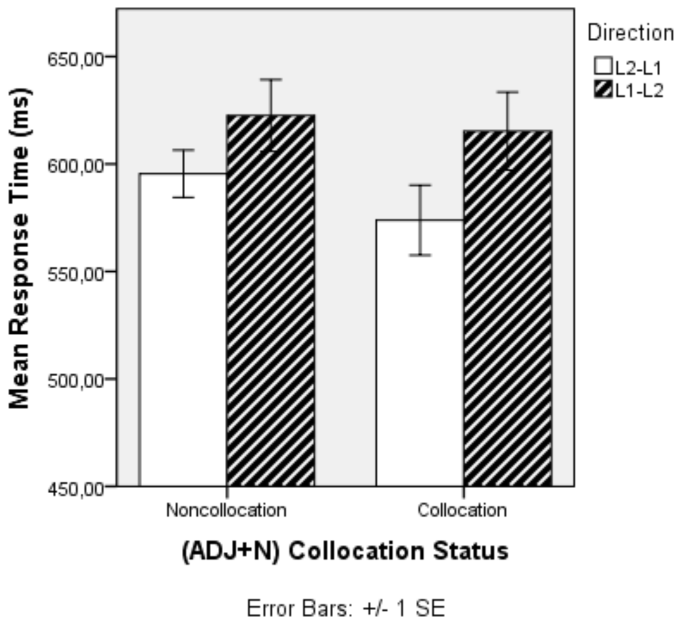

Figure 32 – Mean Response Times in Milliseconds (Direction)

When the presentation direction (i.e. symmetry and asymmetry) is taken into account, it can be seen that collocations are processed faster when they are presented in L2-L1 direction than in L1-L2 direction, the reason of which can be attributed to the native language processing advantage. As for the mean reaction time differences of collocate and noncollocate items, although both instances revealed a possible priming effect, the collocations in L2-L1 direction seem to be processed remarkably faster, causing a mean response time difference of over 21 milliseconds. Therefore, it can tentatively be asserted that cross-linguistic collocational links are playing a role in lexical processing when they are presented in L2-L1 direction and that there are stronger links between word combinations in L2-L1 direction (as in ‘cold savaş / cold war’). Table 25 shows the fundamental statistical output as well as summarizing the mean reaction times of the exploited lexical items with various filters and classifications discussed so far.

Table 25 – Mean Response Times in Milliseconds, Standard Deviations in Parenthesis and Error Rates in Square Brackets (ADJ+N)

*Number of lexical items	Collocation RT	Non-collocates RT	*Priming Effect (millisecond)
All items 30 items	ADJ+N 594.5 (66.73) [0.64%]	ADJ+N 608.6 (53.70) [0.71%]	14.1 *p*=.26 r=.21
Congruence (15 items)	ADJ+N Congruent 594.0 (59.82) [0.34%]	ADJ+N Congruent 608.6 (54.86) [0.56%]	14.6 *p*=.42 r=.22
	ADJ+N Non-congruent 595.1 (75.28) [0.6%]	ADJ+N Non-congruent 609.3 (54.57) [0.53%]	14,2 *p*=.46 r=.20
Language (15 items each)	ADJ+N L1-L2 615.2 (67.84) [0.46%]	ADJ+N L1-L2 622.5 (62.48) [0.3%]	7.3 *p*=.59 r=.15
	ADJ+N L2-L1 573.8 (61.01) [0.58%]	**ADJ+N L2-L1 595.4 (41.12) [0.37%]**	**21.6 *p*=.34 r=.26**
Language and Congruence (7-8 items each)	**ADJ+N L1-L2 Congruent 596.1 (51.62) [0.67%]**	**ADJ+N L1-L2 Congruent 620.1 (68.66) [0.45%]**	**24.0 *p*=.20 r=.47**
	ADJ+N L1-L2 Non-Congruent 639.7 (75.73) [0.98%]	ADJ+N L1-L2 Non-Congruent 612.0 (65.07) [0.67%]	NA
	ADJ+N L2-L1 Congruent 591.2 (74.55) [0.8%]	ADJ+N L2-L1 Congruent 593.1 (26.95) [1.1%]	1.9 *p*=.95 r=.02
	ADJ+N L2-L1 Non-congruent 560.8 (49.94) [0.78%]	**ADJ+N L2-L1 Non-congruent 597.1 (51.12) [0.56%]**	**36.3 *p*=.73 r=.13**

In addition to what was reported in the figures, the table displays the mean reactions times of the collocate and noncollocate lexical items when both direction of the presentation and congruence were taken into account during the analysis. A striking difference can be seen between the mean response times of congruent collocate and noncollocate ADJ+N items when they are in L1-L2 direction (24 milliseconds). An even more noteworthy difference can be observed between the mean reaction times of noncongruent collocations and noncollocations in L2-L1 direction. This can be regarded as an unexpactable finding considering the assumptions made based on the second experiment, indicating that congruence is playing a partial role in cross-linguistic collocational processing, particularly when the lexical items are ADJ+N combinations. Figure 33 attempts to illustrate the mean reaction times of V+N lexical items and provides an opportunity for an analogy.

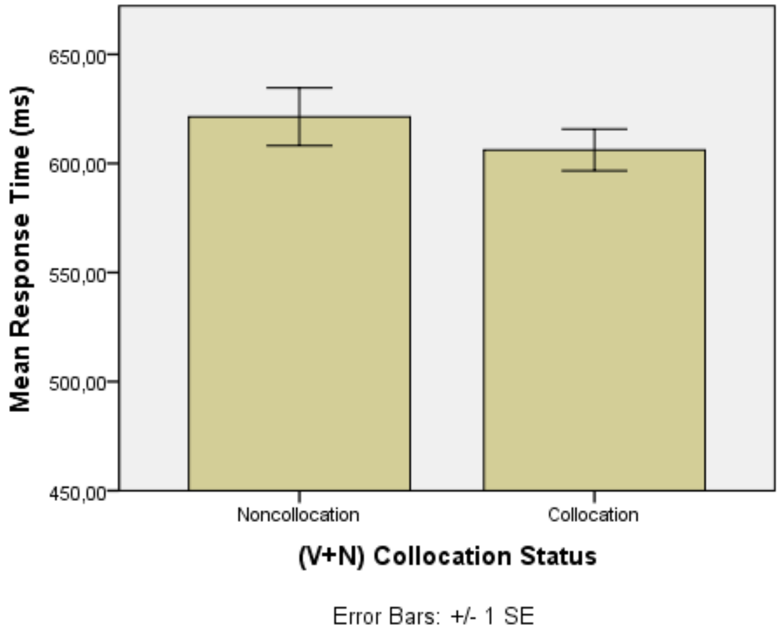

Figure 33 – Mean Response Times in Milliseconds (V+N)

The mean response times differences indicate that V+N collocate items are processed faster than noncollocate items, revealing a 15 millisecond gap between the two item groups, which is similar to the difference reported for the ADJ+N group. Figure 34 includes congruence variable in its depiction when the mean response times are compared.

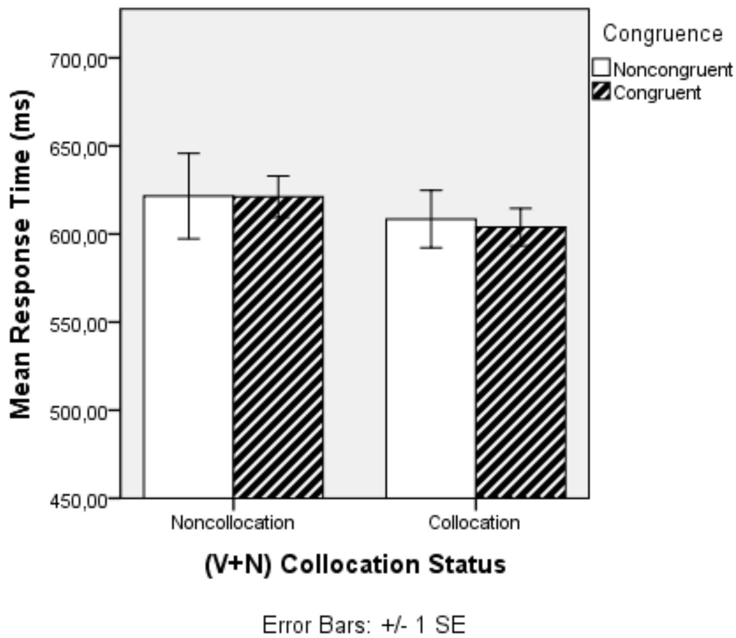

Figure 34 – Mean Response Times in Milliseconds (Congruence)

It can be deduced that congruence does not seem to influence the speed of cross-linguistic collocational processing in V+N word combinations because the difference between the mean response times of congruent collocate and noncollocate items (17.2 milliseconds) and noncongruent collocate and noncollocate items (13.1 milliseconds) appear to resemble. Figure 35 illustrates the analysis output emphasizing the influence of direction on the difference between the mean response times of collocate and noncollocate items.

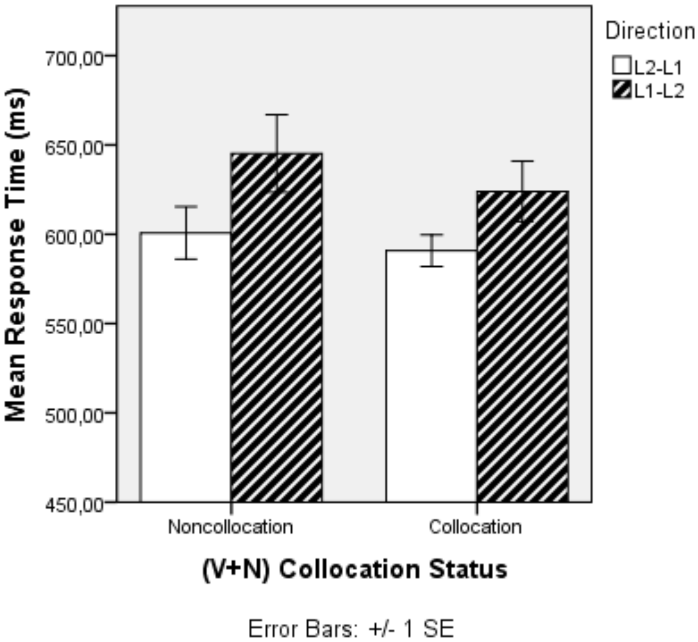

Figure 35 – Mean Response Times in Milliseconds (Direction)

As is seen in the figure, when the exploited V+N lexical items are presented in L2-L1 direction, they are processed faster, which is in line with earlier analysis exploring ADJ+N collocations mainly due to a native language effect. With regard to the difference between the collocate and noncollocate items likely to indicate a priming effect, V+N collocations in L1-L2 direction revealed a bigger gap (21.2 milliseconds) when compared with the corresponding items in L2-L1 direction (10 milliseconds). Table 26 summarizes the mean reaction time differences of V+N collocate and noncollocate items as well as providing some statistical details, *p* value and effect size.

Table 26 – Mean Response Times in Milliseconds, Standard Deviations in Parenthesis and Error Rates in Square Brackets (V+N)

*Number of lexical items	Collocation RT	Non-collocates RT	*Priming Effect (millisecond)
All items 30 items	V+N 606.2 (50.53) [0.48%]	V+N 621.3 (70.01) [0.65%]	15.1 *p*=.21 r=.24
Congruence (15 items)	V+N Congruent 603.9 (39.77) [0.63%]	V+N Congruent 621.1 (44.05) [0.78%]	17.2 *p*=.29 r=.29
	V+N Non-Congruent 608.4 (60.91) [0.98%]	V+N Non-Congruent 621.5 (90.77) [0.56%]	13.1 *p*=.48 r=.19
Language (15 items each)	V+N L1-L2 624.0 (61.05) [0.67%]	V+N L1-L2 645.2 (78.16) [0.77%]	**21.2** *p*=.21 r=.35
	V+N L2-L1 590.7 (34.37) [0.56%]	V+N L2-L1 600.7 (58.84) [1.12%]	10.0 *p*=.58 r=.15
Language and Congruence (7-8 items each)	V+N L1-L2 Congruent 621.1 (46.39) [0,91%]	V+N L1-L2 Congruent 637.9 (41.62) [0.88%]	16.8 *p*=.53 r=.26
	V+N L1-L2 Non-Congruent 627.3 (79.62) [1.2%]	V+N L1-L2 Non-Congruent 653.6 (111.46) [0.95%]	**26.3** *p*=.28 r=.48
	V+N L2-L1 Congruent 586.7 (24.23) [0.67%]	V+N L2-L1 Congruent 604.3 (42.57) [1.1%]	17.6 *p*=.43 r=-.33
	V+N L2-L1 Non-Congruent 594.3 (42.76) [0.9%]	V+N L2-L1 Non-Congruent 597.5 (69.89) [0.45%]	3.2 *p*=.91 r=-.04

*The significance level is .05

As pointed out earlier, the biggest difference between the collocate and noncollocate V+N items that could indicate a possible priming effect is when the items were presented in L1-L2 direction (21.2 milliseconds), especially when the lexical items were noncongruent (26.3 milliseconds). However, the number of the exploited items did not allow the researcher to claim that the observed patterns show a priming effect due to a lack of statistical significance, though the medium effect sizes (*r*=35 and *r*=48, respectively) appear to indicate that the difference is worth considering and may indeed reflect cross-linguistic collocational links in the bilingual mental lexicon to a certain extent.

When the whole experiment output illustrated so far is taken into account, unlike what has been claimed in Experiment 2, the effect of different word order in Turkish and English, or typology in other words, cannot be observed in Experiment 3 as the researcher observed a mean reaction time difference between the collocate and noncollocate items of both ADJ+N and V+N word combinations, revealing a gap of more than 15.0 milliseconds. A striking difference between the two part of speech groups can be seen in the lexical items presented in either in L1-L2 or L2-L1 direction. To be more precise, while the V+N collocations were processed faster than the noncollocations by the participants when they were presented in L1-L2 particularly, the ADJ+N word combinations were processed quicker than the noncollocate items especially when they appeared on screen in L2-L1 direction. Congruence appears to play a partial role when the items are categorized into part of speech groups. For instance, there is a possible priming effect in ADJ+N collocations when they are congruent and presented in L1-L2 direction (24 milliseconds). When they are noncongruent, on the other hand, the presentation in L2-L1 direction creates a 36.3 millisecond difference between the collocate and noncollocate items. As for V+N word combinations, when the items are noncongruent and shown to the subjects in L1-L2 direction, a possible priming effect can be observed (26.3 milliseconds).

The reported results need to be treated cautiously as some of the differences displayed in the tables are not statistically significant due to the limited number of the lexical items employed in the experiment. However, the observed differences are still worth looking into and investigating further since the effect sizes indicate possible significant patterns and observations.

4.2.5.1. Experiment 3 – Regression & Correlation

In line with the second experiment, the third experiment attempts to explore the effect of frequency, congruence and typology (i.e. different word order) on cross-linguistic collocational priming. To this end, a multiple regression analysis was conducted. Mean response times were the dependent variable and *t*, MI, Delta P values in Turkish and English, target word frequency, congruence, part of speech (POS), collocation vs. non-collocation, language (L2-L1 vs. L1-L2) were independent variables. Table 27 indicates statistically significant and nonsignificant predictors of mean response time in the priming experiment.

Table 27 – Regression Results (UK)

Model	*b*	*SE b*	Beta
Constant	853.130	50.544	
POS	-14.267	10.317	-.116
Collocation vs Non-collocation	11.836	43.804	.097
Congruence	3.297	14.325	.045
Language (L1-L2 vs. L2-L1)	170.298	32.130	-1.390**
Target word frequency	-46.457	10.970	-1.138**
TR *t* score	2.943	1.663	.255
TR MI score	-4.413	5.072	-.262
TR $\Delta P_{1\|2}$	21.182	40.839	.077
TR $\Delta P_{2\|1}$	46.753	41.110	.168
ENG *t* score	-1.351	.604	-.376*
ENG MI score	-3.135	6.552	-.195
ENG $\Delta P_{1\|2}$	146.948	232.980	.091
ENG $\Delta P_{2\|1}$	484.649	257.102	-.222*

Note for model 1: R=.578[a] and R^2=.334 (p<.005)
* The significance level is p<.05
** The significance level is p<.01

The results show that the predictors explained 33.4% of the variance (R^2=.334, F=4.09, p<.01) for the regression model. The numbers indicate that the variable, language (i.e. presentation direction) significantly predicted the mean reaction times (β=-1.390, p<.001) of the subjects in the third experiment. Furthermore, target word frequency (β=-1.138, p<.001), *t*-score (β=-.376, p<.05) and $\Delta P_{2|1}$ (β=-.222, p<.05) in English were significant indicators of mean reaction time. In addition to the regression model considering all the possible indicators of mean reaction time, a correlation analysis was computed to look into the relationship between single variables and mean response time.

Table 28 – Correlation Results (UK)

	Mean Response Times UK
Language (L1-L2 vs. L2-L1)	-.334** / r_{pb}= -.32**
Target word frequency	-.198**
Congruence	-.061 / r_{pb}= -.05
POS	-.165* / r_{pb}= -.15*
ENG $\Delta P_{1\|2}$	-.165*
ENG $\Delta P_{2\|1}$	.104
ENG *t* score	-.151*
ENG MI score	-.109
TR *t* score	-.057
TR MI score	-.119
TR $\Delta P_{1\|2}$	-.091
TR $\Delta P_{2\|1}$	-.049

**Correlation is significant at the .01 level
*Correlation is significant at the .05 level

The strongest negative correlation was between the direction of the presentation and mean reaction time (r=-.334/r_{pb}=-.32, p.01). This could be seen as an expected relationship as the subjects responded considerably faster to the lexical items when the target words were in L1. However, the mean reaction time comparisons showed that responding faster in L2-L1 direction did not make these item groups more likely to reveal a priming effect. On the contrary, potential processing advantages underlining a possible priming effect are more likely to be observed when the items were in L1-L2 direction. The second strongest negative correlation was between target word frequency in either English or Turkish depending on the target lexical item and mean response time. In other words, the more frequent the target word was, the faster the participants responded. Therefore, one can state participants were enjoying the processing advantage of higher frequency lexical items, which could contribute to the priming effect. Furthermore, the variable; part of speech and mean response times appeared to correlate significanty (r=-.165/r_{pb}=-.15, p.05), though the correlations were rather weaker. In addition, comparatively less strong correlations can be observed between the collocational frequency values and mean reaction times. For instance, $\Delta P_{1|2}$ (r=-.165, p.05) and t-score (r=-.151, p.05) in English seem to correlate with mean response time, which could indicate that they may be playing a partial role in how fast the collocations were processed. Table 29 filters the part of speech groups and presents the correlations between mean reaction time and the exploited variables.

Table 29 – Correlation Comparing AD+N and V+N Collocations

	Mean Response Times (ADJ+N)	**Mean Response Times (V+N)**
Language (L1-L2 vs. L2-L1)	-.296** / r_{pb}= -.28**	-.378** / r_{pb}= -.36**
Target word frequency	-.232**	-.181*
Congruence	-.060 / r_{pb}= -.06	-.064 / r_{pb}= -.06
ENG $\Delta P_{1\|2}$	-.167*	-.105
ENG $\Delta P_{2\|1}$	.108	.197
ENG *t* score	-.174*	-.061
ENG MI score	-.120	-.074
TR *t* score	-.039	-.066
TR MI score	-.150	-.092
TR $\Delta P_{1\|2}$	-.214*	.067
TR $\Delta P_{2\|1}$	.053	-.133

**Correlation is significant at the .01 level
*Correlation is significant at the .05 level

It was assumed based on the third priming experiment results that collocations in different part of speech groups were not processed in the same manner by the bilingual participants, which is why the correlations between the mean response times of ADJ+N lexical items and mainly frequency values could differ from the possible relationship between the mean reaction times of V+N word combinations and collocational frequency, congruence etc. The results indicated that the most significant, medium, and negative correlations were between the presentation direction and mean response time (*r*=-.296 *p*.01 for ADJ+N and *r*=-.378, *p*.01 for V+N), which was in line with the regression output. Secondly, target word frequency seems to correlate negatively with mean response time in both part of speech groups (*r*=-.232 *p*.01 for ADJ+N and *r*=-.181, *p*.05 for V+N). It can be said that although there was evidence that collocational links were in progress during lexical processing and that collocational frequency was an important factor in the process, single word frequency was still playing a role. While negative correlations can be observed between the mean response times of ADJ+N lexical items and collocational frequency, such as $\Delta P_{1|2}$ (*r*=-.167, *p*.05) and *t*-score (*r*=-.174, *p*.05) in English as well as $\Delta P_{1|2}$ (*r*=-.214, *p*.05) in Turkish, no significant correlations can be seen in the V+N part of speech group.

As far as the second and the third experiments are concerned, the sections so far have provided the results of the mean response time comparisons as well as regression and correlation outputs about the two cross-linguistic priming experiments. With the aim of answering the last research question scrutinizing the relationship between the length of language exposure to L2 or the frequency of language use and cross-linguistic collocational priming, the following part attempts to compare the regression and correlation output of the second and third priming experiments in addition to reporting the mean reaction times of the collocate and noncollocate items in two different settings in a comparative manner. Last but not least, the mean response times of the subjects are compared to explore a possible difference in cross-linguistic collocational processing.

4.2.5.2. Comparing the Results of Experiment 2 and 3

In an attempt to observe the possible influence of the two different language exposure experiences, UK (*N=13*) and Turkey (*N=30*), the mean response times of the participants in the UK and Turkey were set as dependent variables in two separate regression analyses. Table 30 displays the results of the two separate regression analyses for comparative purposes.

Table 30 – Regression Comparing the Output of Experiment 2 and 3

	UK	**TR**	**UK**	**TR**	**UK**	**TR**
Model	***b***		***SE b***		**Beta**	
Constant	853.130	761.260	50.544	33.505		
POS	-14.267	-5.993	10.317	6.839	-.116	-.076
Coll. vs Non-col.	11.836	-33.669	43.804	29.037	.097	-.427
Congruence	3.297	11.286	14.325	9.496	.045	.237
Language (L1-L2 / L2-L1)	170.298	-104.30	32.130	21.299	-1.390**	-1.321**
Target word frequency	-46.457	-26.930	10.970	7.272	-1.138**	-1.024**
TR *t* score	2.943	1.440	1.663	1.103	.255	-.193*
TR MI score	-4.413	.780	5.072	3.362	-.262	.072
TR $\Delta P_{1\|2}$	21.182	12.506	40.839	27.072	.077	.070
TR $\Delta P_{2\|1}$	46.753	-2.462	41.110	27.251	.168	-.014
ENG *t* score	-1.351	-.376	.604	.401	-.376*	-.162
ENG MI score	-3.135	.450	6.552	4.343	-.195	.043
ENG $\Delta P_{1\|2}$	146.948	-82.599	232.980	154.439	.091	-.080
ENG $\Delta P_{2\|1}$	484.649	116.140	257.102	170.430	-.222*	.083
Note for UK model: R=.578[a] and R^2=.334 (p<.005) * The significance level is p<.05 ** The significance level is p<.01						
Note for TR model: R=.543[a] and R^2=.295 (p<.001) * The significance level is p<.05 ** The significance level is p<.01						

The numbers indicate a minor difference between the significant indicators of mean response time in the regression analysis. While the presentation direction and the target word frequency in either Turkish or English are the strongest indicators of mean response time in both the experiments [i.e. TR (β=-1.321, *p*<.01 and β=-1.024, *p*<.01) and UK (β=-1.390, *p*<.01 and β=-1.138, *p*<.01)], *t*-score and $\Delta P_{2|1}$ in English scores comes into play as significant indicators of mean response time (β=-.376, *p*<.05 and β=-.222, *p*<.05, respectively) in the third experiment (cross-linguistic collocational priming study in the UK setting), which could indicate a slight difference in the processing of the collocations cross-linguistically in the mental lexicon of the participants who have been exposed to the target language for at least two years (*Mean*=37.5 month) in a setting where English is the native language. In combination with the regression analysis, a correlation analysis was computed, and the output reflected similar numbers. Table 31 summarizes the correlations between the dependent variable; mean response time and the independent variables; frequency scores, part of speech and presentation direction in two different settings.

Table 31 – Correlation Comparing the Output of Experiment 2 and 3

	Mean Response Times TR	**Mean Response Times UK**
Language (L1-L2 vs. L2-L1)	-.346** / r_{pb}= -.33**	-.334** / r_{pb}= -.32**
Target word frequency	-.210**	-.198**
Congruence	.006 / r_{pb}= .00	-.061 / r_{pb}= -.05
POS	-.134* / r_{pb}= -.13*	-.165* / r_{pb}= -.15*
ENG $\Delta P_{1\|2}$	-.173*	-.165*
ENG $\Delta P_{2\|1}$	.047	.104
ENG *t* score	-.120	-.151*
ENG MI score	-.066	-.109
TR *t* score	-.062	-.057
TR MI score	-.044	-.119
TR $\Delta P_{1\|2}$	-.018	-.091
TR $\Delta P_{2\|1}$	-.062	-.049

**Correlation is significant at the .01 level
*Correlation is significant at the .05 level

As the numbers suggest, there are no major differences between the correlation values when the output of the two experiments are taken into account. The only difference can be seen in the *t*-score in English as there was no significant correlation between the mean response times of lexical items by the bilinguals in the second experiment and the *t*-score representing collocational frequency, whereas a weak correlation can be observed in the third experiment (*r*=-.151, *p*.05), the participants of which have been living in the UK for more than two years and can be assumed to be more sensitive to collocational frequency in their L2. To give a general idea about the mean response times of the collocate and non-collocate items in the second and third experiments in a comparative manner, a descriptive analysis was carried out before moving onto the comparison of the mean response times of the participants in each experiment rather than the lexical items and certain tentative conclusions have been drawn. Table 32 attempts to summarize the mean response times of the lexical items in experiment two and three by classifying them according to part of speech, which was one of the main categorical variables in the experiments.

Table 32 – Part of speech

Part of Speech			Mean Response Time	Std. Dev.
V+N (30 items)	Collocation	UK*	606.21	50.53
		TR	627.03	41.34
	Non-Collocation	UK	621.34	70.01
		TR	621.98	44.33
Experiment 2 - TR priming effect: NA *Experiment 3 - UK priming effect: 15.1 milliseconds				
ADJ+N (30 items)	Collocation	UK	594.54	66.73
		TR	607.25	27.05
	Non-Collocation	UK	608.65	53.70
		TR	620.60	42.62
Experiment 2 - TR priming effect: 13.4 milliseconds Experiment 3 - UK priming effect:14.1 milliseconds				

* possible priming effect

No statistical tests have been computed, but on the whole, it can be seen that ADJ+N collocations produced faster response times than V+N combinations due to a possible processing burden due to the different word order of the two languages, with relatively faster response times for collocations in Experiment three (i.e. in the UK setting). Very similar differences can be observed between the mean response times of ADJ+N collocate and non-collocate items produced by the subjects in the UK and Turkey when the numbers were evaluated from a broader perspective (a 14 millisecond gap in Experiment 3 and a 13.4 millisecond gap in Experiment 2). However, when the V+N lexical items were taken into consideration, the mean response times of the participants in the third Experiment seemed to reveal a bigger difference (15.1 milliseconds) between the reaction times of collocate and noncollocate items than the second Experiment. Table 33 presents the mean response times of the lexical items with a congruence filter.

Table 33 – Congruence

Congruence			**Mean Response Time**	**Std. Dev.**
Congruent (30 items)	Collocation	UK*	589.91	50.10
		TR	610.18	32.94
	Non-Collocation	UK	614.82	49.24
		TR	621.78	43.02
Experiment 2 - TR priming effect: 11.6 milliseconds *Experiment 3 - UK priming effect: 24.9 milliseconds				
Incongruent (30 items)	Collocation	UK	601.73	67.54
		TR	624.10	38.19
	Non-Collocation	UK	615.44	73.76
		TR	620.80	43.95
Experiment 2 - TR priming effect: NA Experiment 3 - UK priming effect: 13.7 milliseconds				

* possible priming effect

When the congruence label was added to the overall analysis, the mean response times for the lexical items by the participants in the 3rd Experiment indicated a slightly faster processing of the collocations than the ones in the 2nd Experiment. In addition, although the mean response times in both experiments revealed differences, the difference between the mean reaction times of collocate and noncollocate items in Experiment 3 (24.9 milliseconds) is considerably bigger than in Experiment 2 (11.6 milliseconds). Another striking result can be seen in the reaction times of incongruent lexical items. Collocate items in Experiment 2 did not result in faster reaction times compared with the noncollocate items. However, the same items in Experiment 3 revealed a mean response time difference of 13.7 milliseconds. This result could be attributed to a stronger link between L1 and L2 congruent collocations only and reliance on L1 while processing collocations for the participants in Experiment 2 (in the Turkish setting) as opposed to the participants in Experiment 3 (in the UK setting) who are exposed to the target language more often, forced to think in L2 and also rely on L1 correspondence due to possible fluency concerns. Table 34 presents a more narrowed down analysis of the mean response times with the help of congruence and part of speech filters.

Table 34 – Part of speech and Congruence

Language			Mean Response Time	Std. Dev.
ADJ+N Congruent (15 items)	Collocation	UK	594.01	59.82
		TR*	599.74	21.85
	Non-Collocation	UK	608.63	54.86
		TR	621.83	48.48
*Experiment 2 - TR priming effect: 22.1 milliseconds Experiment 3 - UK priming effect: 14.5 milliseconds				
ADJ+N Non-congruent (15 items)	Collocation	UK	595.13	75.28
		TR	614.75	30.29
	Non-Collocation	UK	609.32	54.57
		TR	619.37	37.54
Experiment 2 - TR priming effect: 4.6 milliseconds Experiment 3 - UK priming effect: 14.2 milliseconds				
V+N Congruent (15 items)	Collocation	UK	603.93	39.77
		TR	620.61	39.20
	Non-Collocation	UK	621.12	44.05
		TR	621.72	38.52
Experiment 2 - TR priming effect: 1.1 milliseconds Experiment 3 - UK priming effect: 17.2 milliseconds				
V+N Non-congruent (15 items)	Collocation	UK	608.41	60.91
		TR	633.46	43.77
	Non-Collocation	UK	621.52	90.77
		TR	622.23	50.86
Experiment 2 - TR priming effect: NA Experiment 3 - UK priming effect: 13.1 milliseconds				

* possible priming effect

With regard to the variables, part of speech and congruence in combination, a slight difference (7.5 milliseconds) can be observed in the mean response times of ADJ+N congruent collocations comparing the two experiments. However, a major difference can be detected in the V+N, congruent collocations group. To be more precise, while the participants in Experiment 2 responded at almost the same speed to the collocate and noncollocate items in the priming experiment, the participants in Experiment 3 responded approximately 17 milliseconds faster to the collocate items, which could indicate a priming effect. Additionally, some striking differences can be observed in incongruent items both for ADJ+N and V+N groups. The analogy reveals that the participants in Experiment 3 responded considerably faster to the collocate items in both part of speech groups even when the lexical items were incongruent. The fact that the participants in Experiment 3 reacted faster to the incongruent items as opposed to the participants in Experiment 2 could be attributed to different language exposure experiences resulting in different lexical processing times and distinct cross-linguistic links in their mental lexicons. Table 35 displays the mean response times with a presentation direction filter.

Table 35 – Presentation Direction

Language			**Mean Response Time**	**Std. Dev.**
L1-L2 (30 items)	Collocation	UK	619.43	63.57
		TR	629.55	39.80
	Non-Collocation	UK	633.42	70.04
		TR	636.18	46.91
Experiment 2 - TR priming effect: 6.6 milliseconds Experiment 3 - UK priming effect: 14 milliseconds				
L2-L1 (30 items)	Collocation	UK*	582.67	48.91
		TR	604.73	27.21
	Non-Collocation	UK	598.14	49.07
		TR	606.40	33.51
Experiment 2 - TR priming effect: 1.7 milliseconds *Experiment 3 - UK priming effect: 15.5 milliseconds				

* possible priming effect

As far as the presentation direction is concerned, the mean response times of the collocations in L1-L2 direction by the participants in Experiment 2 were similar to the ones by the participants in Experiment 3, whereas a different scenario is true for the items in L2-L1 direction. In the UK setting, a 15.5 millisecond difference was observed between the collocate and noncollocate items when they were in L2-L1 direction unlike the case in the Turkish setting. Although making conclusive comments seems impossible due to a lack of statistical analysis, the difference could indicate a slight variation in the processing of collocations cross-linguistically, or the influence of L1 on the processing of collocations in L2 for the bilinguals living in the UK and Turkey. Table 36 illustrates the mean response times filtered with POS and presentation direction.

Table 36 – Part of Speech and Presentation Direction

Language			Mean Response Time	Std. Dev.
ADJ+N L2-L1 (15 items)	Collocation	UK*	573.84	61.01
		TR	600.86	23.99
	Non-Collocation	UK	595.41	41.12
		TR	607.12	32.41
Experiment 2 - TR priming effect: 6.3 milliseconds *Experiment 3 - UK priming effect: 21.6 milliseconds				
ADJ+N L1-L2 (15 items)	Collocation	UK	615.21	67.84
		TR*	613.64	29.20
	Non-Collocation	UK	622.54	62.48
		TR	634.08	48.19
*Experiment 2 - TR priming effect: 20.04 milliseconds Experiment 3 - UK priming effect: 7.3 milliseconds				
V+N L2-L1 (15 items)	Collocation	UK	590.70	34.37
		TR	608.60	30.44
	Non-Collocation	UK	600.73	58.84
		TR	605.68	35.71
Experiment 2 - TR priming effect: NA Experiment 3 - UK priming effect: 10 milliseconds				
V+N L1-L2 (15 items)	Collocation	UK*	624.03	61.05
		TR	645.46	43.44
	Non-Collocation	UK	645.22	78.16
		TR	638.28	47.19
Experiment 2 - TR priming effect: NA *Experiment 3 - UK priming effect: 21.2 milliseconds				

* possible priming effect

When the part of speech label was incorporated into the classification, a similar pattern was detected. That is to say, faster response times for the L2-L1 collocations by the participants in Experiment 3 and more prompt response times for L1-L2 collocations by the subjects in Experiment 2 considering ADJ+N part of speech category. On the other hand, the participants in Experiment 3 responded faster to the V+N items both in L2-L1 and L1-L2 direction with a bigger difference in L1-L2 direction (21.2 milliseconds). It can be assumed based on the reported difference between the second and third experiments that frequency of language use and language exposure in a setting where native language is English could affect how V+N collocations in particular are processed cross-linguistically. Table 37 summarizes the mean response times with filters like POS, congruence, and presentation direction and narrows down the search.

Table 37 – Part of Speech (ADJ+N), Congruence and Presentation Direction

Language			Mean Response Time	Std. Dev.
ADJ+N L2-L1 Congruent (7-8 items)	Collocation	UK	591.21	74.55
		TR	594.61	18.43
	Non-Collocation	UK	593.11	26.95
		TR	604.42	45.48
Experiment 2 - TR priming effect: 9.8 milliseconds Experiment 3 - UK priming effect: 1.9 milliseconds				
ADJ+N L2-L1 Non-congruent (7-8 items)	Collocation	UK*	560.83	49.94
		TR	606.32	28.05
	Non-Collocation	UK	597.13	51.12
		TR	609.47	17.73
Experiment 2 - TR priming effect: 3.1 milliseconds *Experiment 3 - UK priming effect: 36.3 milliseconds				
ADJ+N L1-L2 Congruent (7-8 items)	Collocation	UK*	596.17	51.62
		TR*	604.23	24.77
	Non-Collocation	UK	620.12	68.66
		TR	637.06	48.57
*Experiment 2 - TR priming effect: 32.8 milliseconds *Experiment 3 - UK priming effect: 24 milliseconds				
ADJ+N L1-L2 Non-congruent (7-8 items)	Collocation	UK	639.70	75.73
		TR	624.38	31.95
	Non-Collocation	UK	612.01	65.07
		TR	630.68	51.40
Experiment 2 - TR priming effect: 6.3 milliseconds Experiment 3 - UK priming effect: NA				

* possible priming effect

As for the analysis compiling all the labels under the ADJ+N group, the first remarkable difference (36.3 milliseconds) considering the response times for the collocational items only was for L2-L1 non-congruent items in Experiment 3, which could be explained by a possible code-switching effect while using the target language and exposure to the collocations both in L1 and L2 cross-linguistically due to the environment the UK participants are in and the requirements of the setting, which will be discussed further in the following sections. As to the other presentation direction, L1-L2, the mean response times of the congruent collocational items by the participants in Experiment 2 are 8 milliseconds faster than the ones by the participants in Experiment 3. The difference between the mean response times of collocate and non-collocate items with a possible priming effect in the different categories indicated that L1-L2 direction for both congruent and incongruent items did not reflect a noteworthy difference between the two experiments; however, a similar trend cannot be observed in the mean response time differences of the items in L2-L1 direction. L2-L1 direction reflected considerable differences between the mean response times of the noncongruent collocate and non-collocate items in each setting. The same pattern cannot be observed for the congruent items, indicating slight variations in collocational processing. Table 38 reports the mean response times with filters including POS (V+N), congruence, and presentation direction.

Table 38 – Part of Speech (V+N), Congruence and Presentation Direction

Language			**Mean Response Time**	**Std. Dev.**
V+N L2-L1 Congruent (7-8 items)	Collocation	UK*	586.71	24.23
		TR	595.65	36.24
	Non-Collocation	UK	604.30	42.57
		TR	610.60	32.01
Experiment 2 - TR priming effect: 15 milliseconds *Experiment 3 - UK priming effect: 17.6 milliseconds				
V+N L2-L1 Non-congruent (7-8 items)	Collocation	UK	594.32	42.76
		TR	619.93	20.32
	Non-Collocation	UK	597.51	69.89
		TR	601.37	40.33
Experiment 2 - TR priming effect: NA Experiment 3 - UK priming effect: 3.2 milliseconds				
V+N L1-L2 Congruent (7-8 items)	Collocation	UK*	621.11	46.39
		TR	642.45	27.93
	Non-Collocation	UK	637.93	41.62
		TR	631.46	43.10
Experiment 2 - TR priming effect: NA *Experiment 3 - UK priming effect: 16.8 milliseconds				
V+N L1-L2 Non-congruent (7-8 items)	Collocation	UK*	627.30	79.62
		TR	648.91	58.88
	Non-Collocation	UK	653.64	111.46
		TR	646.07	53.82
Experiment 2 - TR priming effect: NA *Experiment 3 - UK priming effect: 26.3 milliseconds				

* possible priming effect

Looking at the issue from the angle of V+N collocations, very similar mean response times can be seen for both congruent and noncongruent V+N collocate and noncollocate items (revealing similar differences) in L2-L1 direction. However, when the presentation direction was in L1-L2, the participants in Experiment 3 responded remarkably faster to the collocate items than the noncollocate ones, showing a 16.8 millisecond gap for congruent items and 26.3 millisecond gap for incongruent ones. An overall conclusion that can be drawn form the general picture is that the participants in the UK appear to process V+N combinations in a different manner than the participants in Turkey at the cross-linguistic level, especially when they are presented in L1-L2 direction, which is not the case for ADj+N lexical items. A possible explanation could relate to code-switching effects addressed earlier and will be discussed further. Furthermore, congruence seems to be less important for the participants in the UK, based on their mean response times in the priming study than it is for the subjects in Turkey, the possible reasons and implications of which will be scrutinized in the following sections.

4.2.5.3. Comparison of the Participants in Turkey (Experiment 2) and the UK (Experiment 3) based on the Mean Response Times

Follwing the separate regression and correlation analyses for the participants' mean response times for the collocations in order to detect possible differences regarding the indicators of mean response time and the correlation of mean response time with the independent variables, the mean response times of each participant groups in both experiments were considered to make a comparison based on the mean reaction times of the subjects rather than the response times for the lexical items. An independent samples *t* test was conducted to compare the mean response times of the participants in the second and third cross-linguistic collocational priming experiments. The results indicated that there was not a statistical difference between the mean response times of the subjects in the UK (3^{rd} Experiment, M=625.17, SD=97.54) and Turkey (2^{nd} Experiment, M=641.30, SD=121.68) for the collocate items (t(41)=.42 and p=.67). Likewise, when their mean response times for the non-collocate items were analysed, no significant difference could be observed (M=637.79, SD=117.08 for UK and M=640.74, SD=124.09 for TR); (t(41)=.73 and p=.94). Although the researcher made some comments regarding the different response times for the lexical items in various categories produced by the participants in two separate settings to unpack the patterns observed, which are conceived as worth commenting on due to the possible processing differences, those remarks should be tentatively treated since the response times of the participants in the second and third experiments (i.e. Turkey and UK settings) did not reveal a significant difference on the whole.

4.2.6. Experiment 3 – Initial Discussion of the Findings

Research Question 6
Is there a relationship between the type of L2 exposure and collocational priming?

No statistically significant difference between the participants' response times in the UK (Experiment 3) and Turkey (Experiment 2) was detected as a result of the *t*-test, but the lexical items in certain groups revealed certain tendencies and some important patterns were observed for the two different groups, which are worth commenting on and deserve some interpretations. The comparison of the regression and correlation analyses also did not reflect any significant differences. One of the differences was regarding the collocational frequency values in English (*t*-score and $\Delta P_{2|1}$), which were significant predictors of the mean response times of the collocational items, based on the responses of the subjects in Experiment 3 only. The same values were not significant indicators of mean response time based on the responses of the participants in Experiment 2.

The assumption was that a situation or context where a bilingual needs to switch between languages densely is likely to result in faster processing of L1-L2 or L2-L1 lexical combinations and more sensitivity to collocational frequency since the links between the related items seem to strengthen. Considering the effect of language exposure of the participants in Experiment 3, L1 Turkish - L2 English bilinguals who have been living in the UK for more than two years to have their MA or PhD education are inclined to codeswitch between the two languages, especially when they have difficulty to find a word in a specific language. In a situation like that (i.e. 'tip of tongue' situation) they prefer to use the lexical item that pops into their head first, whether it is English or Turkish.

For instance, they may say ‘meeting set etmek (set a meeting), gym’e gitmek (go to the gym), gloomy hava (gloomy weather), strong kahve (strong coffee), heavy yağmur (heavy rain) etc.’ Living in an atmosphere where the dominant language is English tends to encourage them to use that language in combination with Turkish particularly when they are conversing with their Turkish folks, the cause of which can be explained by the strong lexical links between the languages in their mental lexicon and the fact that the conceptualizations in two languages begin to merge. It can even be stated that the ease of access for collocations in each language appears to change with the direct effect of language context/exposure. This influence can also be related to proficiency of the bilingual, but it may not be the only explanation. This situation can be rationalized by the fact that the bilinguals in the Turkish setting (in Experiment 2) in the current study performed better in the vocabulary size test (though the difference between the two groups were not statistically significant), but a weaker relationship was observed between the frequency values and their mean response times in the cross-linguistic priming experiment.

It is claimed that codeswitching tends to indicate a high level of proficiency in both languages, and is employed by the bilinguals in certain discourse (Gardner-Chloros, 2009). The appropriate discourse for the participants of the current research in the UK was when they were with their L1 Turkish friends and had to switch back to their less active native language. Prior and Gollan (2011) also assert that bilinguals who are inclined to codeswitch more often in their daily life seem to perform better in psycholinguistic tasks focusing on cross-linguistic influence than those who codeswitch less frequently. As stated earlier, some significant patterns were observed when the mean response times of the lexical items were analysed under two different headings; the mean response times of the collocate and non-collocate items by the UK participants as opposed to the mean response times by the participants in Turkey. For one thing, when the lexical items were analysed in terms of part of speech in Experiment 2 and 3, the difference between the mean response times of

ADJ+N collocate and noncollocate items was similar (13.4 ms for Experiment 2 and 14.1 ms for Experiment 3). A more striking pattern was observed for V+N collocations. The numbers indicated that the difference between the mean reaction times of collocate and noncollocate items was 15.1 milliseconds in Experiment 3, whereas no possible priming effect was observed in Experiment 2. When congruence was taken into account without considering two part of speech groups, it was observed that participants in Experiment 3 responded faster to congruent lexical items, revealing a 24.9 millisecond gap than the participants in Experiment 2, in which the difference between the mean reaction times of congruent collocations and noncollocations was 11.6 milliseconds. More importantly, it was observed that the participants in the UK setting (i.e. in Experiment 3) did not seem to rely on congruence as much as the paricipants in Experiment 2. In other words, they responded faster to the collocations even when the lexical items were incongruent in Turkish and English, which can be deduced by the mean reaction time difference of incongruent collocate and noncollocate items (13.7 milliseconds). That is to say, it can be assumed that the effect of congruence on cross-linguistic collocational priming is weaker for the participants in Experiment 3 in the UK setting. How UK participants react to congruent items in the priming experiment seem to differ possibly due to the setting they are exposed to the target language, how frequent they use them and how they are entrenched in their mental lexicon. It seems that congruence is more important for the participants in Experiment 2 in the Turkish setting during cross-linguistic lexical access considering the subjects' response times when the items are congruent in the priming experiment. When the effect of congruence was explored within a certain part of speech group, it was seen that congruence was playing a role for the participants in Experiment 2, particularly while processing ADJ+N congruent word combinations. When it comes to incongruent ADJ+N items and both congruent and incongruent V+N items, on the other hand, the participants in Experiment 3 had a trend indicating faster reaction times for collocate items with a 14.2 millisecond difference for noncongruent ADJ+N collocations, a 17.2 millisecond difference for congruent V+N items and a 13.1 difference for noncongruent V+N items, whereas no possible priming effect was observed in the reaction time of the participants in Experiment 2 in relation to the V+N lexical items in particular. Another striking pattern that needs scrutiny was related to the direction of the priming. The participants in Experiment 3 in the UK setting responded faster to the collocations regardless of their presentation direction (a 13 millisecond gap between the collocate and non-collocate items in L1-L2 and a 15.5 millisecond difference in L2-L1 direction). However, the same processing speed leading to faster response times for the collocate items in either direction could not be observed for the participant responses in Experiment 2. Therefore, it can be assumed that there were stronger links between the lexical items in different directions in the bilinguals' internal lexicon having taken part in the two experiments.

This pattern becomes more apparent when the lexical items are filtered as ADJ+N and V+N. As far as the ADJ+N collocations are concerned, the difference between the mean response times of the participants in Experiment 3 was 21.6 when the items were in L2-L1 direction, reflecting a possible strong priming effect. On the other hand, the same was true for the mean reaction time of the participants in Experiment 2 when the exploited lexical items were in L1-L2 direction. It was obvious based on the mean reaction time differences that the participants in Experiment 2 and 3 seemed to process the collocations in a different way crosslinguistically, reflecting strong cross-linguistic collocational links in their mental lexicons primed in different directions. As for the V+N collocations with either L2-L1 or L1-L2 direction, it was realized that the mean reaction times of the participants in Experiment 2 did not reveal any faster processing instances in either direction. Therefore, it was assumed that different word order of Turkish and English was likely to have an inhibitory effect on collocational priming by causing a processing burden for the participants; in other words, blocking the spreading activation of the items at the collocational level. However, the difference between the mean response times of collocate and noncollocate items both in L2-L1 direction (10 milliseconds) and particularly in L1-L2 direction (21.2 milliseconds) in Experiment 3 indicated that participants in the UK had stronger V+N collocational links in their mental lexicon at the cross-linguistic level even if the word order was different in the two exploited languages. These processing differences can be the result of the exposure to L2 in a native environment and frequency of target language use as well as the possible code-switching tendency of the participants in Experiment 3 due to the setting they are using the language. When the items were classified considering all the variables in the experiment; that is, part of speech, congruence, and presentation direction, it was detected that the first striking pattern was the difference between the mean response times of noncongruent ADJ+N collocate and noncollocate items in L2-L1 direction in Experiment 3 (36.3 milliseconds), indicating a strong priming effect. With regard to the other presentation direction, it was seen that the differences between the mean reaction times of congruent collocations and noncollocations in both the experiments revealed similar numbers (32.8 milliseconds for Experiment 2 and 24 milliseconds for Experiment 3). It was clear that congruence was playing a crucial part especially when the ADJ+N lexical items were in L1-L2 direction. It was concluded that code-switching tendencies of the participants and the environment they are exposed to the language can be given as the main cause of the mean reaction time differences between the two experiments reported so far. It was observed that bilinguals in the UK tend to codeswitch during language production when the collocation they employ is a non-congruent item in Turkish, which could result in stronger links in either L2-L1 or L1-L2 directions and facilitate the process of priming in the same direction when the items are non-congruent. Therefore, the collocations are likely to be entrenched the way they are frequently used in their lexicon and this tendency might have affected the observed priming patterns in the experiments.

Overall, it can be stated that the way collocations are processed cross-linguistically seem to be influenced differently by the time spent in the natural setting of the target language (ESL setting) than the time spent studying the language per se in an unnatural setting. The reason for that could be the natural encouragement to think in L2, more time spent using the language with more exposure to collocations and the need to codeswitch while conversing with L1 peers in a native language setting. You may be more primed to activate the target language due to the environment you are in and more primed to activate both languages spontaneously because of your daily needs. This in turn may lead to different reaction trends (e.g. faster reaction time in L2-L1 by UK participants) in a cross-linguistic collocational priming study; that is to say, possible different processing patterns cross-linguistically at the collocational level. Therefore, one can say that there is a partial relationship between the type of exposure to L2 in the UK (i.e. frequency of language use and in what setting you are exposed to the language) and cross-linguistic collocational priming as the results of the current study indicate it has the tendency to influence priming direction and create a difference in how ADJ+N and V+N collocations are processed in particular.

The sections up to this point have tried to discuss the related literature, enlighten the main purpose of the research, elaborate the methodology and present the results and initial discussion of the priming experiments as well as the correlation and regression analyses. The following chapter will discuss the findings within the scope of the mental lexicon frameworks proposed in earlier research before suggesting a humble model of bilingual mental lexicon networks highlighting the collocational links in the L1 Turkish-L2 English bilingual mental lexicon.

CHAPTER 5
GENERAL DISCUSSION

5.1. INTRODUCTION

The current study made use of collocations in its investigation, categorized these lexical combinations based on their part of speech (ADJ+N vs V+N) and sought to investigate the existence of (cross-linguistic) collocational priming in the L1 Turkish-L2 English bilingual mental lexicon, initially. Furthermore, different measurements of collocational frequency were taken into account as important variables to explore their effect on the processing of collocations in the bilingual mind. Additionally, in the second and third experiments, the lexical items in each category were also classified as congruent and non-congruent, which was in line with many research studies (e.g. Wolter and Gyllstad, 2013) conducted earlier in order to see the difference in cross-linguistic lexical interaction (i.e. symmetrical and asymmetrical), if any. The findings could help find proof for cross-linguistic spreading lexical access at the collocation level and may explain whether or to what extent frequency of the collocation, part of speech, syntactic-order based differences and congruence play a role in this process, and the results were discussed and interpreted in that respect. Moreover, similar to the studies focusing on the interaction of translation equivalent and semantically related words in the bilingual mental dictionary, which aim to challenge the language-specific paradigm, the results of the current study could boost the language non-selective hypothesis in bilingual lexical access by providing proof for spreading cross-language collocational access by focusing on a language which has not been studied before. Last but not least, within the scope of this study, the possible effect of language exposure and the role code-switching tends to play in the bilingual mental lexicon, particularly in terms of collocational networks, were scrutinized. The findings indicated that different language exposure experiences were likely to influence how collocations are processed cross-linguistically. In brief, having a language non-selective stance based on the results of the priming experiments, it can give us a clear notion regarding how the bilingual mental lexicon is structured, how or if the L1 and L2 collocational knowledge interact in the bilingual lexicon and why the two internal lexicons interact the way they are at the collocation level. Another minor contribution could be regarded as the listing of the frequent English and Turkish collocations and their categorization in terms of congruence, which is lacking in the literature. The lists can set the base of a learner corpus targeting English-Turkish bilinguals, which the researcher aims to build following the current research study and by way of which common collocational errors and their cognitive reasons could be explored. Though it is not the core aim of the study, the findings can guide the English Language Teaching specialists or course book designers when deciding what collocations to include in their curriculum and with what approach it is best to introduce these collocations to second language learners with different proficiency levels. The following section (a) highlights the key findings of the research and (b) discusses them within the scope of the suggested and related bilingual lexicon models and approaches the issue of lexical organization in the internal lexicon from a collocational perspective.

5.2. INTEGRATING THE RESULTS INTO THE SUGGESTED MODELS

Models of bilingual mental lexicon having a language non-selective stance account for cross-language effects, some of which have been addressed in the literature review[43], by assuming a cognitive architecture (i.e., neural network) that is shared for both languages of a bilingual, with interconnections between linguistic representations both within and across languages (e.g. De Bot 2004; Poulisse and Bongaerts 1994). The following section will provide a general discussion of the findings within the scope of the related literature and current theories of lexical activation/access in the bilingual brain before interpreting how (cross-linguistic) collocational links or networks relate to the current models of bilingual mental lexicon.

[43] See Section 2.3.3.

5.2.1. Experiment 1

The results of the first priming experiment indicated that there appeared to be collocational priming in Turkish for both ADJ+N and V+N collocations in L1 Turkish-L2 English bilingual mental lexicon and the observed priming effect appears to be in line with Hoey's (2005) assertions. In addition, as Durrant and Doherty (2010) states frequency has an important influence on collocational processing and thus it plays a significant role in collocational priming. The findings of this study not only confirm Hoey's (2005) claims but also extends his ideas with the help of empirical evidence gathered from a priming experiment exploring a typologically different and underrepresented language in the literature in terms of collocational processing research. Some studies have tested Hoey's theory as it relates to English; however, research in other languages is scarce. Therefore, this study exploring collocational priming in Turkish helps consolidate Hoey's remarks with respect to collocational priming and appears to make them more reliable and generalizable. It should also be noted that more research studies considering different lemmas of a word in Turkish as a new variable are needed to see the whole picture of collocational processing in an agglutinative language, Turkish. Another important finding of the first experiment in addition to the observed collocational priming effect was the frequency influence in the process. The correlation results indicated that there were significant negative correlations between both target word frequency and collocational frequency and the mean response times in the priming experiment, which could suggest that the frequency of Turkish lexical items is playing a crucial role in collocational processing in the bilingual mental lexicon. In other words, the more frequent the presented collocations were, the faster the participants responded to those word combinations and this processing facilitation was regarded as the main reason for the priming effect in the experiment. A major contribution of this study to the literature could be regarded as the fact that collocational priming in Turkish was bidirectional, which could be claimed based on the correlation between the mean response times and ΔP in both directions. Therefore, one can claim that it was either the node or the collocate item which triggered the spreading activation and lead to priming in the experiment. Another reason for this phenomenon could be explained with the help of the flexibility of word order in N+V collocations in spoken Turkish. To be more precise, although the items in the priming experiment were presented in V+N order (though the regular word order is N+V in Turkish) due to the follow-up procedure in mind, a significant priming effect was observed, which could have stemmed either from this elasticity in N+V collocation production or the bidirectional processing nature of the exploited lexical items. It is commonly accepted that collocations and other formulaic expressions are stored holistically in the mental lexicon and they tend to accessed in the form of chunks during language production by native speakers, which facilitates processing and native speakers tend to enjoy a processing advantage with the dint of formulaic expressions (Wray, 2012). Frequency has a deep impact on how these expressions are stored and how easily they are retrieved. Ellis (2002a) states that language users are highly sensitive to the frequency of the lexical items and frequency influence can be observed in every aspect of language processing and production. Frequency determines how probable a construction is to be encountered by native speakers and how strongly it is entrenched in the mental lexicon. Depending on how firmly entrenched these constructions are, their processing becomes more automatized and the encounter with one part of the construction by a native speaker is likely to trigger the rest of it in his/her mental lexicon. It is also claimed by Langacker (1987) that there is a strong positive correlation between the entrenchment of words and their frequency of use. The spreading activation and the degree of entrenchment seem to underlie the collocational priming effect in the internal lexicon. Therefore, it can be claimed that lexical nodes bear links with each other at various levels, i.e. paradigmatic and syntagmatic connections from a broad perspective. Those links help the processing of lexical items and the activation of one node appears to spread to other related nodes (e.g. from a node to a collocate as in ‘commit suicide’ or from a lexical item to a semantically related lexical item as in ‘doctor-nurse’). With regard to a mental lexicon framework emphasizing the effect of collocational priming on lexical activation and access in its explanation in addition to semantic association, phonological and orthographic influences, The Spreading Activation Model (Collins and Loftus, 1975) can be given as an ideal depiction. The model underlines the activation of semantically related lexical units and how the activation of one node spreads to the other. Although the model does not consider any syntagmatic relations in its illustration, it is believed that collocational links can be effectively explained through this model and this extension should be seen as a major contribution of the current study to the related literature. For instance, based on the assumptions of this framework, it can be said that when a prime word is presented to an L1 user (e.g. 'sağanak-heavy' or 'soğuk-cold'), it activates the related node in the lexicon and this activation spreads to its collocate (e.g. 'yağmur-rain' or 'savaş-war') and facilitates its processing as well as some semantically related items, such as light, weight or hot, peace etc. Spreading activation can be affected by some factors, which are salience and frequency of lexical items and the strength of collocational links. It is asserted by Schmid (2007) that a cognitive unit (i.e. a collocation) is considered salient if it is stored in the mental lexicon as a chunk and kept ready to be processed in the current working memory. Because the use of cognitive units which are already activated entails little cognitive effort, one can state that there is a strong correlation between high degree of cognitive salience and a processing effort. In other words, the more salient a cognitive unit is, the faster it is activated and processed. Salience and frequency, which are two important concepts affecting one another, play a significant role in lexical processing and have an impact on how the mental lexicon is organized (Tomasello, 2003). Based on the discussion so far regarding the collocational priming effect in Experiment 1 with Turkish lexical items and the influence of frequency on this process, a lexical organization network centring on the spreading activation model has been proposed. The network basically illustrates the collocational and semantic links in the mental lexicon. An analogous cross-linguistic version of this model was put forward by Wolter and Yamashita (2013), which will be discussed further in the following section discussing cross-linguistic collocational priming. Within this network, the concepts representing higher lexical nodes are presented in capital letters, whereas the lexical units are displayed in small letters. Two-way arrows indicate a potential bidirectional interaction and one-way arrows show the possible direction of the lexical spreading, from the concept to the lexical item. Activation of certain concepts is assumed to trigger the lexical items related to that concept (semantic or collocational in this case) together with the corresponding conceptual domains. The activation seems to take place both at the syntagmatic level as well as paradigmatic level in the proposed lexical organization framework and the strength of the links between the lexical units appear to be influenced by the frequency of the lexical units and the collocations. This must be seen as one layer of the lexical activation and access procedure. Different layers including phonetics, morphology and orthography can be added; however, they are not the main focus of the current study and needs to be explored in separate research. The sample mental lexicon network illustrated in Figure 36 displays a collocational activation link with an ADJ+N lexical unit for illustrative purposes and based on the results of Experiment 1, it can be claimed that the same is true for V+N collocations and that the activation is bidirectional. It should also be noted that the proposed network is nothing more than an assumption based on the results of this humble research study and more empirical studies are required for a more generalizable and multi-layered depiction of the internal lexicon at the lexical activation and access levels, in particular.

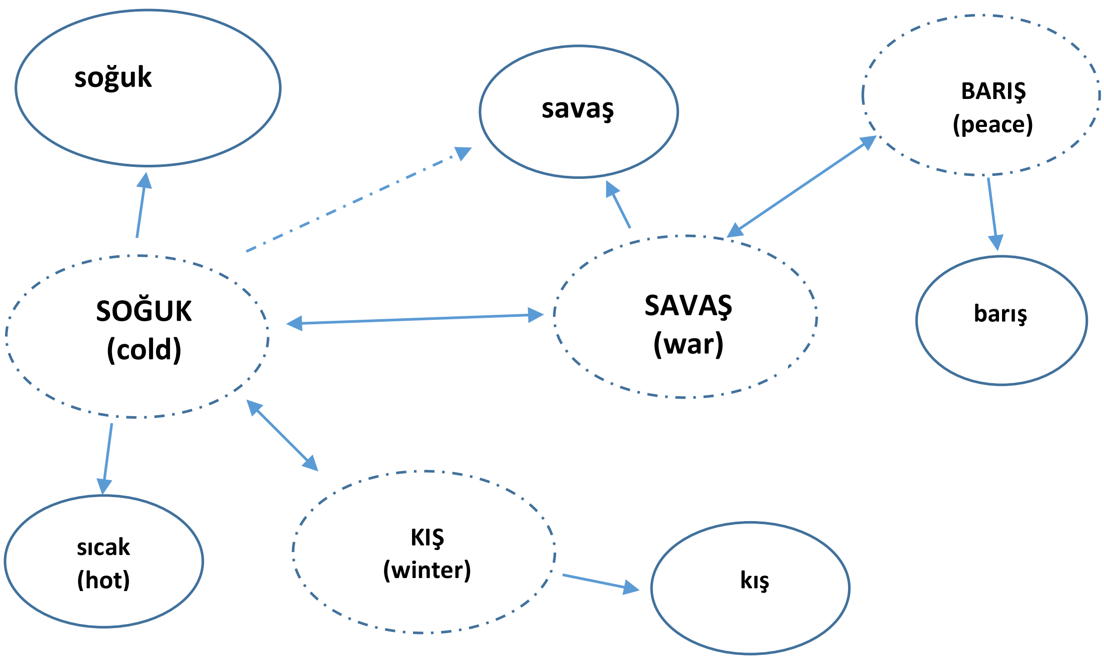

Figure 36 – L1 Turkish Collocational Network

The provided network is based on the assumptions and the findings of Experiment 1. It should also be emphasized that the proposed organization lacks the morphological aspect of the Turkish language, which could provide different layers to the explanation and it should be addressed in further research. The collocational spreading network and its effect on the internal structures of mental lexicon ought to be investigated further with the help of other cognitive methodologies apart from the priming paradigm, such as eye tracking (see Roberts and Siyanova-Chanturia, 2013; Carrol and Conklin, 2014 for a review on the use of eye-tracking to explore lexical processing) and neuroimaging (see Henson, 2003 for a review of neuroimaging studies of priming). Until more evidence gathers addressing the issue in typologically different languages from different angles and including various layers of language representations, the notion of collocational spreading activation needs to be addressed tentatively. This study concentrating on the collocational priming and the influence of frequency on collocational processing in Turkish can be considered as a stepping-stone and hopes to pave the way for more studies investigating lexical processing and formulaic language in Turkish.

5.2.2. Experiment 2

Once empirical proof was found indicating that collocational priming exists in Turkish and that frequency values have inverse correlations with the mean response times in Experiment 1, it was possible to continue with the second step of the procedure looking into the existence of cross-linguistic collocational priming in the L1 Turkish L2 English bilingual mental lexicon. In addition, the possible effect of frequency (*t*-score, MI, and ΔP), congruence, part of speech, and language exposure on the priming effect was scrutinized.

The results of the 2nd priming experiment indicated that cross-linguistic collocational priming exists for ADJ+N collocations in the bilingual mental lexicon, in particular. However, although the participants responded faster to some of the collocate items within the V+N group in the cross-linguistic priming experiment, the difference between the mean response times of collocate and non-collocate items didn't reveal a significant difference. As discussed earlier, significant priming effect for ADJ+N collocations and insignificant priming effect for V+N collocations can be attributed to the regular word order in Turkish, which is N+V (as in 'karar verm- / make a decision'), as opposed to the English word order, which is in V+N (as in 'make a mistake'). That the collocational items were presented in V+N direction for a specific purpose to explore the effect of typology was assumed to have an inhibitory effect on the processing of V+N collocations cross-linguistically. However, the same inhibition was not observed in ADJ+N collocations since the word order in English and Turkish regarding this collocation group is the same. Eventually, this inhibition effect (i.e. the effect of different word order) was observed in the mean response times of the lexical items in two different groups. The correlation results also appear to support the argument as there is a negative correlation between the variable, part of speech and the mean response times. That is to say, the participants in Experiment 2 responded faster to the ADJ+N collocations, which resulted in a significant priming effect. The faster reaction times help explain the difference between the mean response times of the two groups of lexical items and support the notion of cross-linguistic spreading activation at the collocational level.

Dijkstra and van Heuven (1998) mention the notion of inhibition in their BIA model[44]. They state that when a word in the target language, for instance, is followed by a word in the speaker's native language or the other way around, the language user spends more time to recognize it as the language processor needs to handle the inhibition of words in the target language as a result of being exposed to it first. This processing latency stems from the fact that the language nodes in the target language are activated first. What the current study suggests on top of that assertion as an alternative approach is that there is an inhibitory effect of different typology in Turkish and English when the V+N collocations are presented to the bilinguals in either L1-L2 or L2-L1 direction. Therefore, it can be concluded that different word order appears to cause a

[44] See the details in Section 2.3.3.

processing burden and lead to an insignificant priming effect. Although it wasn't one of the main investigations of the current study, this inhibitory effect or the processing burden can also be observed when the mean response times in Experiment 1 are compared with the mean reaction times in the cross-linguistic priming experiments (i.e. Experiment 2 and 3). Obviously, when a prime in L1 is followed by a target in L1, the processing is considerably faster when they are in either L1-L2 or L2-L1 direction.

Both collocational (*t*, MI and ΔP values) and target word frequencies play a partial role in Experiment 2 reflecting cross-linguistic collocational processing based on the results of the correlation and regression analyses underlining the association measures (i.e. frequency) as significant indicators and correlates of response time. Therefore, it can be stated that the findings of this research appear to be consistent with a growing body of evidence showing that advanced L2 language users are sensitive to frequency effects both in their native language and in the L2 and that lexical combinations as well as single lexical units are entrenched in the non-native speakers' mental dictionary to a certain extent (Durrant and Schmitt, 2010). It could also mean that the way native and non-native speakers process collocations seems to differ due to the ongoing effect of target word frequency during cross-linguistic collocational processing. Wray (2002) claims that native speakers process formulaic expressions including collocations in chunks and they do not decompose them into single units during language production, which help them in their fluency. Non-native speakers, on the other hand, do not process the formulaic expressions including collocations holistically according to her. Because the current research indicates that target word frequency still matters during collocational processing for even advanced L2 English users, it would be considered logical to agree with Wray's (2002) claim to a certain extent; however, further empirical evidence is needed for conclusive remarks. There are also some studies showing that even when there is a processing advantage for frequently employed formulaic expressions, the frequency impact of single words which comprise these expressions still exists (e.g. Snider and Arnon, 2012). A possible explanation for a varying degree of reliance on single word frequency and collocational frequency could be the proficiency levels of the bilinguals, but the current study does not consider different proficiency levels as a variable and thus fails to account for this phenomenon. A discussion on the possible effect of proficiency on collocational processing can be seen in Wolter and Yamashita (2017). Another issue to stress is the fact that significant negative correlations in the study can be partially attributed to the effect of frequency on cross-linguistic collocational priming, which has a lot in common with emergentist theories of language highlighting the sensitivity of language acquisition and lexical processing to frequency effects (Kemmer and Barlow, 2000). To be more precise, the fact that a lexical combination is frequent in either English or Turkish helps make the item more entrenched in the bilingual mental dictionary and leads to a processing advantage both in the native language and cross-linguistically. When frequency is supported by congruence; that is to say, if a collocation has high frequency and at the same congruent in Turkish and English, its processing is facilitated even more and thus is more likely to result in cross-linguistic priming, especially for ADJ+N collocations in the current study.

There are some bilingual mental lexicon models emphasizing language non-selective activation of words, such as BIA and BIA+ (Dijkstra and van Heuven, 1998, 2002). In these models, cross-language activation is defined as automatic and out of bilinguals' control. In the light of the claims of these frameworks, we can assume that high frequency collocations (ADJ+N collocations, in particular) that are congruent in Turkish and English in particular, are stored and processed in a similar manner to the single lexical items. Namely, when a collocation in one language is activated, its associated collocation is also activated in the other language, which could account for the priming effect observed for ADJ+N collocations in Experiment 2. The issue of frequency effect within the explicitly activated or across languages (English and Turkish for the current research) during lexical processing is still controversial in the literature, but the results of the current experiment tentatively supports the influence of frequency across the two languages by claiming that there is a negative correlation between mean response times in the priming experiment and certain association measures in English (*t*-score, $\Delta P_{1|2}$) and target word frequency in either Turkish or English. It must also be noted that the more frequent a collocation is in either L1 or L2, the more likely the bilinguals encounter it in the input and use it productively. This helps the language users entrench the word combinations further in their mental dictionary, which could ultimately result in faster cross-linguistic collocational processing. As far as the second correlation analysis comparing the relationship between the frequency values and the mean response times in two separate part of speech groups, ADJ+N – V+N, is concerned, stronger correlations can be detected in the ADJ+N group. This finding seems to consolidate the assumptions made by the writer after the observed priming effect for this part of speech group only. Frequency values (MI in Turkish, $\Delta P_{1|2}$ in both languages) had inverse correlations with the mean reaction times in Experiment 2, which indicates a crucial role of collocational frequency in collocational processing by bilinguals.

One of the most noteworthy results in Experiment 2 was the influence of the priming direction on the mean response times and the priming effect. Obviously, the reaction times for the collocations in L2-L1 direction were considerably faster than the ones in L1-L2 due to the native language processing advantage. However, when the gap between the mean response times of the collocate and non-collocate items was taken into account, the collocations in L1-L2 direction revealed a much stronger priming effect. Furthermore, when the collocations were filtered according to presentation direction and congruence at the same time, the collocations in L1-L2 direction indicated an even stronger priming effect (more than a 30 millisecond gap). However, due to the small number of experimental collocational items after the filtering, the *t*-test comparing the mean response times of the lexical items in question did not reveal a statistically significant difference. This finding seems to correlate with previous assertions regarding the priming asymmetry (Jiang and Forster, 2001). However, it should be noted that all the earlier studies claiming priming asymmetry in cross-linguistic priming focused on semantic relatedness, translation equivalence, and cognates etc. However, no research, to the writer's knowledge, has approached the issue and explained the phenomenon from a syntagmatic perspective. This finding could also be taken as proof for more robust links in the mental lexicon of bilinguals (L1 Turkish-L2 English) in L1-L2 direction at the collocation level indicating a cross-linguistic collocational spreading activation.

5.2.3. Experiment 3

When the mean response times of each participant in Experiment 2 and 3 were compared, no statistical difference was observed. However, the mean response times of the lexical items by the participants in Experiment 2 and 3 (i.e. TR vs. UK settings) revealed some marked patterns which need unpacking and are likely to trigger further investigations in future research.

Overall, it was detected when the mean response times in two different settings (i.e. in Experiment 2 and 3) were compared that the difference between the mean response times of the collocate and non-collocate items by UK participants were bigger when the collocations, particularly for V+N collocations, (e.g. GIVE-İZİN / give permission or AL-/PLEASURE / take pleasure) were taken into account. However, the same gap was not observed in ADJ+N lexical items. It can be assumed that the inhibitory effect observed for V+N collocations in Experiment 2, which could be seen as a factor interrupting spreading activation, was not valid for the participants in Experiment 3, although it was not the regular word order in their L1. Furthermore, when the mean response times of the collocate and non-collocate items by the participants in Experiment 3 were observed, it was recognized that UK participants were as sensitive to congruence as the subjects in Experiment 2. In addition, the mean response times of the noncongruent lexical items in Experiment 3 also revealed a possible priming effect for both ADJ+N and V+N groups. Therefore, it was concluded that the participants in Experiment 3 appeared to process noncongruent collocations differently from the participants in Experiment 2, where a direct inhibitory effect of noncongruence can be seen in the reaction times of the bilinguals in Turkey. More strikingly, having filtered the lexical items as incongruent ADJ+N collocations in L2-L1 direction, the researcher found a major gap between the mean response times of collocate and non-collocate items in Experiment 3. The fact that congruence may not have the same effect on collocational processing of the UK participants as it has on the subjects in Turkey might be related to the distinct language exposure experiences or the type of exposure to L2 in its natural setting. Namely, participants in the UK tend to use those collocations in spontaneous speech every day and they are exposed to them more frequently than the subjects in Turkey. That is why, it is possible that in the mental lexicon of the bilinguals in the UK, there are weaker links between the congruent collocations or the effect of L1 on collocational processing in L2 seems to weaken. It can also be claimed that some concepts start to merge in the bilingual mental lexicon when the language users are exposed to the language in its native setting for a while. In other words, the links between L1 and L2 congruent lexical items seem to fade in time as language users gain proficiency. It can even be claimed that when some bilinguals hear a lexical item in their L2, the activation of that word may not spread to its L1 counterpart, especially when there is no congruence between the lexical nodes and this has a direct effect on the organization of the bilingual mental lexicon depending on in what context and how frequent the target language is used. Overall, it can be assumed that the participants of Experiment 2 had more limited exposure to the target language in its natural settings, where everyday conversations are full of formulaic expressions and collocations, whereas the participants of Experiment 3 appeared to use the target language more frequently, were exposed to collocations in a native speaking environment more often and showed the tendency to switch between languages due to the requirements of their bilingual social circle, the members of which also have to use some word combinations or clusters in L2 some of which are incongruent in their L1 requiring them to codeswitch from time to time to compensate for the conceptual differences in the two languages, ease the processing burden and keep the conversation going. It is claimed that the bilinguality of a context has the potential to influence code-switching behaviour and can hence have an impact on the degree of cross-language activation. This effect has been addressed by Grosjean (2001, 2008), who argued that interlocutors, the location you are exposed to the language, and practicality concerns of a bilingual are likely to affect the tendency to codeswitch and thus appear to play a significant role in the state of activation of the bilingual's languages. Therefore, one can state that research on co-activation in bilinguals (e.g. cross-linguistic collocational priming) can thus provide insights into the effect of code-switching on cognitive processes. Likewise, code-switching (more specifically, how much bilinguals rely on code-switching) can help understand the underlying factors affecting cross-language lexical activation differences. Wolter (2006) states that building syntagmatic relations between words in an L2 appears to be remarkably more challenging than the process of building paradigmatic connections since constructing syntagmatic relations may require restructuring of the existing networks and schemas, which will result in more automated processing of collocations. The faster response times for the incongruent collocations in L2-L1 direction in Experiment 3 by the UK participants may be explained with the help of these strong syntagmatic relations in their L2 alone due to the entrenchment of those units as chunks. The salience of those incongruent collocations (e.g. heavy rain) in L2 and the fact that the participants in the UK are exposed to these units considerably more than the participants in Turkey is likely to bring about more sensitivity into these incongruent lexical units. Therefore, it can be claimed that when a participant in the UK is provided with the prime word 'heavy', it is likely to activate the word 'rain' and then its Turkish counterpart 'yağmur' in the bilingual mental lexicon much more quickly than it does for the subjects in Turkey. One last explanation provided for the faster response times in L2-L1 direction by the UK participants was their tendency to codeswitch while conversing with their L1 Turkish L2 English friends. This inclination is likely to provide them with a processing advantage in the processing of collocations cross-linguistically, L2-L1 direction in particular. As Bialystok (2009) suggests the architecture behind the processes influenced by bilingualism is expected to be based on networks of connections. These networks of connection, the strength of which depend on collocational frequency and the frequency of use in a native environment for the current research, appear to change the way collocations are processed or primed cross-linguistically. She further states that different bilingual experiences have the capacity to affect cognitive function and, to some extent, cognitive structure, which could help explain the possible code-switching effect put forward based on different processing times in L1-L2 and in L2-L1 in two different experiments. One can also claim that differing processing patterns observed in Experiment 2 and 3 could be the result of the varying proficiency levels of the participants in two different settings. However, it is asserted based on the findings of this study that rather than the overall proficiency levels, different L2 exposure experiences of the participants seem to influence the processing times of the collocations in Experiment 2 and 3. As the participants in the two different experimental settings had a vocabulary size above a certain standard (i.e. mean vocabulary size in each experiment was above 8000-9000 vocabulary size benchmark[45]) and since there was no statistical difference between their mean reaction times in the priming experiments, it would not be accurate to say that the participants in Experiment 3 who had been living in the UK for at least two years were more proficient than the participants of Experiment 2 (or vice versa) and the observed differences in reaction time was due to different proficiency levels. The plausible explanation, though needs further investigation from different angles, could be that the participants of Experiment 2, though they are advanced L2 users with years of experience in not only target language use but also teaching, have limited exposure to the target language, particularly in a native environment and that they are mainly exposed to the language by non-native speakers, which are not expected to consist as many collocations or formulaic expressions as a native speaker language. Based on their research findings, Durrant and Schmitt (2009) also state that non-native language users tend to underuse strongly associated collocations that are highly salient for native language users and commonly employed in everyday language in native English speaking context. This claim could help to a certain extent explain the different entrenchment of those word combination in the bilingual mental lexicon and the varying priming patterns (i.e. collocational processing differences) detected in Experiment 2 and

[45] See Section 3.3.2.2. and 3.3.2.3. for the related discussion.

3. Based on the results of the cross-linguistic priming experiments (Experiment 2 and 3), the patterns observed and the related discussion so far, a bilingual mental lexicon network emphasizing collocational processing at the cross-linguistic level can be proposed. In accordance with Wolter and Gyllstad's (2011) proposed framework, titled "Dual Activation of Collocational Connections" which stresses the influence of L1 on L2 collocational processing, the present study proposes a network of lexical processing, named "Cross-linguistic Collocational Spreading Activation", which has its roots in Collins and Loftus' (1975) Spreading Activation Model. Wolter and Gyllstad (2011) and Wolter and Yamashita (2014) having a language non-specific lexical activation stance posit that congruent collocations in L1 and L2 are activated concurrently in the bilingual mental lexicon. That is to say, the activation of a congruent collocation in L1 facilitates the activation of the corresponding collocation in L2, which indicates strong links between L1 and L2 at the collocational level even for advanced L2 English users. As an extension to their model, the current research, having a languge non-selective stance based on the results of Experiment 2 and 3, approaches the issue from a cross-linguistic perspective and investigates the activation of collocations either in L1-L2 or L2-L1 direction with various labels, such as part of speech and congruence and thus extends the framework proposed by Wolter and Gyllstad (2011). In the light of the remarks and assumptions so far, the humble frameworks in the following section, proposed based on the results of the current research, investigating the existence of collocational priming in L1 Turkish-L2 English bilingual mental lexicon, attempt to model the cross-linguistic spreading activation of collocations and discuss the issue of bilingual mental lexicon from a cognitive and psycholinguistic perspective.

5.2.4. Mental Lexicon Networks for Cross-linguistic Collocational Priming in L1 Turkish - L2 English Bilingual Mental Lexicon

Having the existence of collocational priming in Turkish in mind and considering the influence of part of speech on the cross-linguistic collocational priming and the effect of congruence on the activation of collocations cross-linguistically, the network below depicts a spreading activation network for ADJ+N collocations as a sample and attempts to model the cross-linguistic nature of collocational processing. V+N collocations were not illustrated due to a lack of priming effect for those word combinations, particularly in Experiment 2. The proposed cross-linguistic collocational networks take the results of Experiment 2 as the basis of their illustration since the population size of the second experiment is bigger than Experiment 3, so the statistical data is more reliable and the findings are more generalizable. The results of Experiment 3 will also be taken into account when the incongruent collocational links in the bilingual lexicon are tentatively illustrated and when the findings are discussed in relation to the model, Lexical Representation and Development in L2 by Jiang (2000). In Figure 37, the concepts are shown in capital letters and lexical units are given in small letters. Two way arrows represent the possible bidirectional link between the concepts and lexical units. One way arrows, on the other hand, stand for the possible direction of spreading activation and the strength of the link. The curved arrows reflect the possible spreading activation direction during lexical processing and represent one possible scenario. The strength of the link between the concepts and the lexical items seem to differ according to the frequency of the lexical and collocational items.

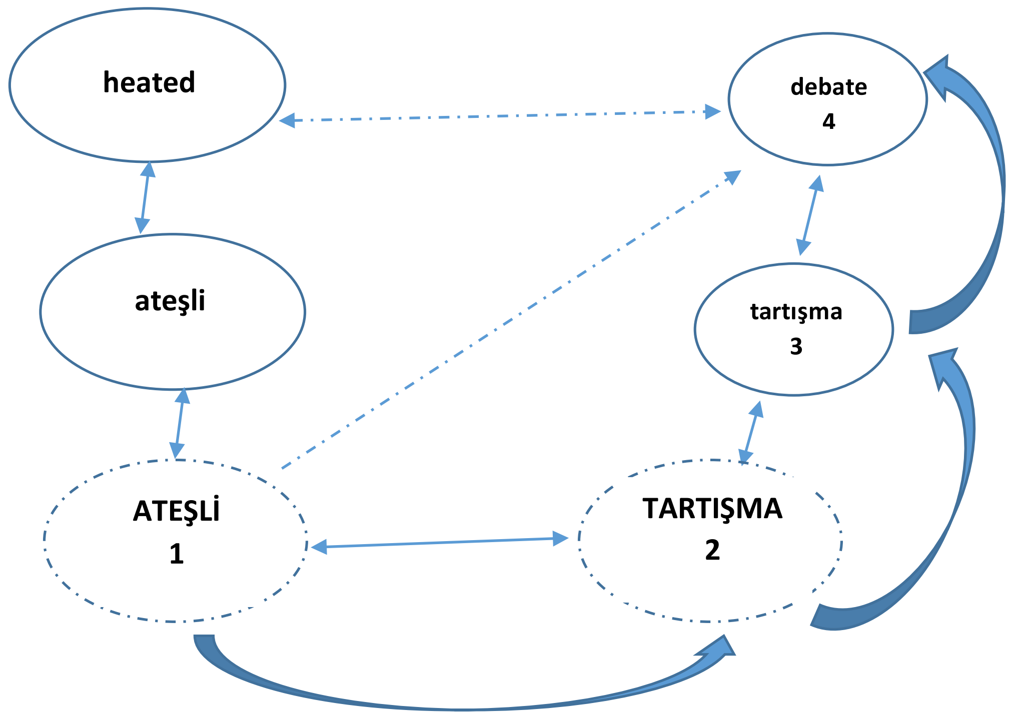

Figure 37 – Cross-linguistic Collocational Network (L1-L2 / Congruent)

The figure illustrates the spreading activation network for congruent ADJ+N collocations in L1-L2 direction. As discussed in previous sections, congruence and presentation direction are two important factors contributing to processing times and have a significant effect on collocational priming. Faster spreading activation in L1-L2 direction and thus faster reaction times are indicators of priming asymmetry (Jiang and Foster, 2001). The processing advantage of congruent collocations is also in line with Wolter and Gyllstad’s (2011) claims. What Figure 37 tries to explain is that when an L1 word is activated as it is presented as the prime, it stimulates both the collocate of that item in L1 but also the translation equivalent of the collocate in L2. For instance, when the prime (node) is ‘ateşli (heated)’, it triggers both the L1 collocate ‘tartışma’ and the translation equivalent ‘debate’ as long as they are congruent in both languages and share the same conceptual framework. Though it is not depicted in the figures, another scenario could be as follows; when the prime word is presented in L1, it stimulates the translation equivalent in L2 and the L2 node then triggers or primes the collocate. To exemplify, when the prime is ‘soğuk’ it primes the translation equivalent node ‘cold’, which then primes the collocate ‘war’ in L2 and that is how the cross-linguistic collocational priming takes place. However, based on the results of the first experiment proving the existence of collocational priming in Turkish, the first depiction seems more likely to reflect the spreading activation network in L1-L2 direction for congruent ADJ+N collocations. Furthermore, the results indicate that there are stronger links between a node and a collocate in L1-L2 direction, particularly if a collocation is a congruent ADJ+N word combination. The previous attempts to model the bilingual mental lexicon through Spreading Activation Framework (Collins and Loftus, 1975) approached the issue from a paradigmatic perspective. That is to say, they considered semantically related items in their depiction and ignored the syntagmatic links. Figure 38, on the other hand, illustrates the possible collocational spreading activation pattern in L2-L1 direction. Although there were some mean reaction time differences likely to indicate collocational priming in L2-L1 direction in Experiment 3 (e.g. noncongruent ADJ+N collocations in L2-L1 direction), the current research, on the whole, could not find strong statistical evidence to support the notion of collocational priming in this direction, so the depiction should be considered tentatively and be accepted as a possible model.

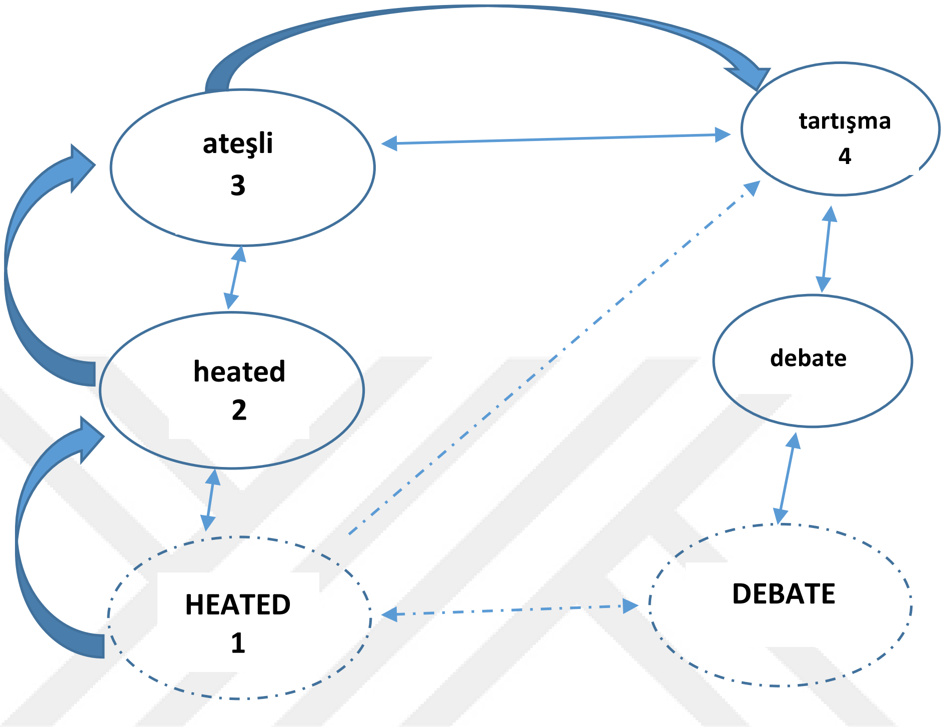

Figure 38 – Cross-linguistic Collocational Network (L2-L1 / Congruent)

As is discussed earlier, although the L1 target words following an L2 prime caused faster reaction times, the gap between the mean response times of collocate and non-collocate items did not reveal a statistically significant priming effect. In other words, the fact that a prime word in L2 is presented as a node did not facilitate the activation of its collocate item in L1, which seems to indicate that the collocational links in L2-L1 direction is weak in the bilingual mental lexicon. Figure 38 tries to model the possible spreading activation network when the node in L2 activates its translation equivalent in L1 and then the activation spreads to the collocate in L1. However, further investigation taking into account different aspects of the issue is needed for conclusive remarks. Figure 39 displaying the processing of non-congruent collocational items are provided based on the results of Experiment 3 indicating a possible priming effect for noncongruent ADJ+N collocations in L2-L1 direction, but won't be discussed in details as there isn't enough empirical data to support them and they should be treated tentatively.

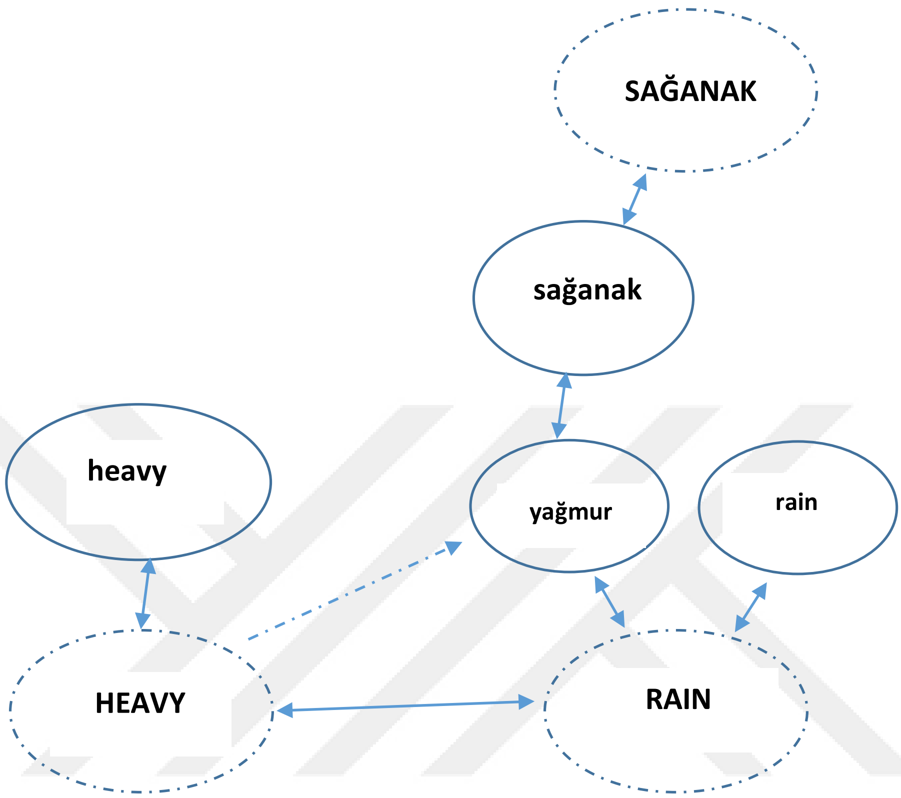

Figure 39 – Cross-linguistic Collocational Network (L2-L1 / Non-Congruent)

Although no significant patterns were revealed as a result of the priming experiment for noncongruent collocational items in L1-L2 direction, the results of Experiment 3 conducted in the UK setting indicated a possible priming effect for noncongruent V+N collocate items which was beyond the initial assumptions of the study and was attributed to the nature of the environment the participants use their L2 and their inclination to be flexible in their language choice due to their social community including late bilinguals like themselves who are immersed into a context full of frequent collocations and formulaic expressions. As an additional explanation to the frequency of use and its impact on the strength of the links between lexical items in the lexicon, one can consider the influence of recency on priming direction. Recency stands for the language a person has used recently and more dominantly, which could bring about a higher level of activation in the bilingual mind (Jarvis and Pavlenko, 2008).

Namely, the participants in Experiment 3 exposed to L2 in an English dominant environment can be expected to be more sensitive to L2 and the related lexical items can be activated faster in their lexicon due to the recency effect, which could eventually lead to a stronger spreading activation in L2-L1 direction. It must also be noted that recency can affect the tendency to codeswitch in a certain direction (i.e. L2-L1 or L1-L2), which could in turn help collocational links in either direction depending on the dominant language in use to get stronger in the bilingual mental lexicon. Figure 40 attempts to illustrate the possible spreading activation network likely to be observed in the L1 Turkish-L2 English bilingual mental lexicon for incongruent collocations in L1-L2 direction.

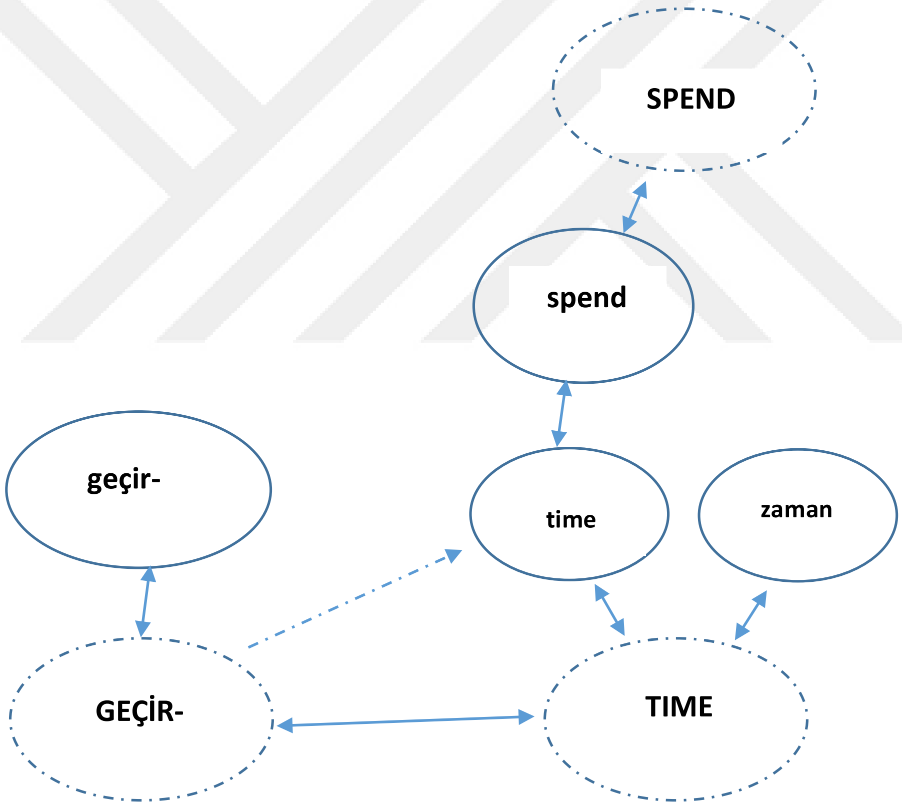

Figure 40 – Cross-linguistic Collocational Network (L1-L2 / Non-Congruent)

Although no remarkable patterns were observed in this study regarding processing of the incongruent collocations cross-linguistically when all the lexical items were taken into account as a whole, there were some single incongruent lexical combinations revealing faster response times in the priming experiment in both experimental settings. The reason for this facilitation could be the code-switching tendency addressed based on the comparions of the mean response times in Turkey and the UK (i.e. Experiment 2 vs. Experiment 3). To be more precise, some lexical items may have triggered cross-linguistic collocational priming even if they were incongruent in Turkish and English owing to the individual differences of the subjects in the study regarding their target language exposure and how entrenched these collocations are in their lexicons both as chunks in either language and cross-linguistically. Investigating the existence of collocational priming of the incongruent collocations in L2 for L2 English users may also contribute to our overall understanding of the processing of these items by non-native speakers. Therefore, future studies exploring this phenomenon from the angles mentioned above or considering some other aspects ignored here are likely to uncover a potential pattern in the bilingual mental lexicon. Although some research (e.g. Brysbaert and Duyck, 2010) claims that the 'Revised Hierarchical Model' has a language selective lexical access perspective and the current research embraces a language non-selective stance based on the experimental results, the activation of collocations at a cross-linguistic level can also be explained based on the framework titled Modified Hierarchical Model (MHM) by Pavlenko (2009), which is an extension of the Revised Hierarchical Model (RHM), by Kroll and Stewart (1994). In accordance with the findings and remarks of the current research, MHM asserts a language non-specific access at the conceptual level, though further claims that there may also be language specific domains. The activation of L1 specific or L2 specific concepts can still trigger lexical items in both lexicons. Therefore, it may be assumed that the mental lexicons of bilinguals are merged, but the strength of the links between the lexical items or between the concepts and the lexical items appear to change according to frequency, proficiency in language, language exposure, recency of L2 use etc. MHM posits that the main purpose of L2 vocabulary learning is conceptual restructuring and development of target-like linguistic categories. This approach to vocabulary learning or acquisition is also important for the current study as the investigation includes some incongruent collocations, the lexical members of which may belong to different conceptual representations. The inhibition of incongruence due to the potential effect of L1 on collocational processing in L2, which seemed to block collocational spreading activation was observed in the current study (particularly in Experiment 2) and it was thought that MHM may help model this collocational processing difference in the bilingual mental lexicon.

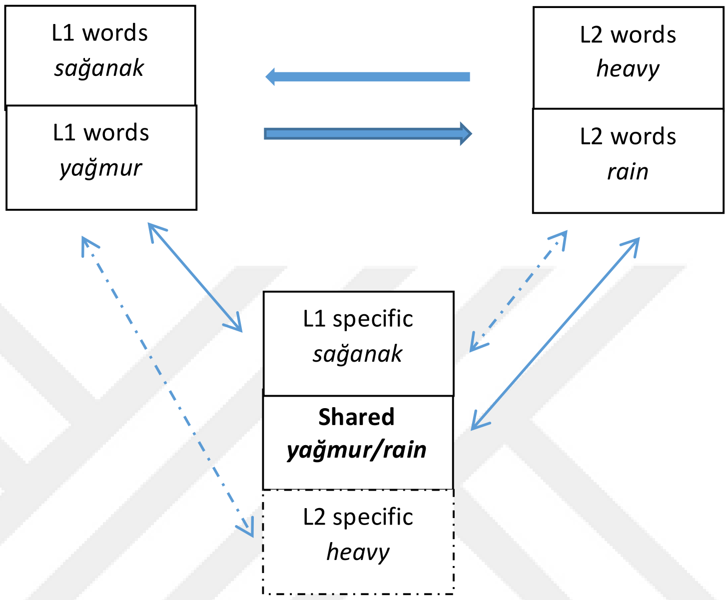

Figure 41 – Modified Hierarchical Model Highlighting Collocational Networks (adapted from Pavlenko, 2009)

Extending Kroll and Stewart's (1994) RHM, MHM (Pavlenko, 2009) takes into account the developmental transition from lexical to conceptual mediation in second or foreign language acquisition. It also integrates the concepts of shared and partially shared representations which some earlier models have adopted. MHM differs from previous models in that it categorizes conceptual representations into three separate groups; L1 specific, L2 specific, and overlapping. The notion of language-specific lexical concepts has a lot to say with regard to bilingual lexical processing. The common assumption is that the construction of a linguistic message starts at the shared conceptual system, which seems to activate lexical links both in L1 and L2 (Costa, 2005). If some linguistic units are language or culture specific, it means that only one language may have the required lexical items or they are represented differently in two languages, which could result in a processing burden during cross-linguistic activation or a failure in fluency (Pavlenko, 2003). In an attempt to compensate for the lack of a similar conceptual unit, bilinguals may try code-switching as a coping strategy. The issue of incongruence may be approached from this perspective. Furthermore, according to this model, the activation process turns into a bidirectional interaction between the mind and the environment. That is to say, these language specific domains activate concepts and frames related to one language and inhibit their spread to other nodes, which leads them to be less accessible. There is much research which focuses on cross-cultural influence and discusses the context-dependent nature of bilingual cognition (e.g. Hong et al., 2000). The patterns observed when the mean response times of the collocations in Experiment 2 and 3 were compared can be attributed to the effect of the cultural setting as well as different language exposure experiences on cross-linguistic lexical representation. It must also be noted that frequency and salience of the lexical items and the proficiency levels of the L2 users are important factors associated with the strength of the links between the lexical items or the lexical items and the concepts.

Overall, the model can help explain the results of the cross-linguistic priming experiment revealing a priming effect for congruent ADJ+N collocations and the inhibitory effect of the incongruent collocational items during cross-linguistic collocational processing interrupting spreading activation. In other words, as the mean response times in Experiment 2 suggest and is discussed in relation to the Spreading Activation Model, cross-linguistic collocational spreading activation can be observed in congruent items; however, incongruent lexical items cannot be processed as fast due to the processing burden resulting from the fact that the lexical items are not represented in the shared domain, which seems to prevent them from spreading to other lexical nodes. It is believed that these models illustrating the bilingual lexical activation are suitable examples that can be employed to shed light on the (cross-linguistic) collocational priming phenomenon and the results of the current research also fit into the overall explanation provided with the help of these frameworks. As is discussed in

Jarvis and Pavlenko (2008), studies investigating cross-linguistic interaction in the bilingual mental lexicon suggest that word knowledge includes three levels of representation, which are lexemes, lemmas and concepts. Mental associations may be formed between words within and across languages (as in collocations for the current research). These associations can also be observed within and across layers of representation. It must be underlined, though, that lexical representations and the associations between them seem to vary in terms of strength depending on the frequency of the lexical items, for instance, which was an important indicator of reaction time in the current research as well. The strength of the relationship between the lexical units or concepts (e.g. *t*-score or MI score reflecting frequency) are thought to influence how accessible they are, through which mental routes they will be retrieved and accessed (e.g. L1-L2 or L2-L1), and how likely they are activated during the use of another language (i.e. whether the lexical activation is language specific or language non-specific). It is claimed that lexical items from both the languages compete for lexical activation / selection in the bilingual mental lexicon during language production and comprehension; however, a certain level of proficiency[46] is necessary for the lexical items in two languages to compete for selection (De Bot, 2004). In addition to frequency, the strength of the representations based on the proficiency level of the users (advanced L2 English users in the current study), order of acquisition, similarities between the native language and the target language, and typological similarities between the two languages (reflected through ADJ+N and V+N collocations in the current study) seem to play an important role in the interaction of L1 and L2 and the background activation of the passive language during lexical access. When lexical items in the native language are highly activated, they can affect the speed of lexical processing and lexical decisions in the target language or the activation of a lexical item in L2 may facilitate the access of another word in L1 (e.g. a node in L1 may trigger a collocate in L2), (De Bot, 2004). However, it is also likely that the activation of one language can act as an intrusion into the activation of the other, which may lead to inadvertent language switches,

[46] See Section 3.3.1.2. for a discussion of correlation between vocabulary size and overall language proficiency and Section 3.3.2.2. and 3.3.2.3. for the participants' language background.

especially when the activated lexical nodes do not have the same conceptual representations in two languages (as in incongruent collocations in the current study). Although the model (MHM) does not consider collocational links in its depiction, the extended version illustrated in this research can assist in looking at the issue from a collocational perspective.

The last model that can help interpret the results of the current study and illuminate the issue of cross-linguistic collocational processing from a developmental perspective is Lexical Representation and Development in L2 by Jiang (2000). Although the model addresses the lexical representation in L2 at the single word level, it is believed that it can also illustrate the representations at the collocational level. This idea is in line with a previous study exploring collocational links in L2 mental lexicon (Wolter and Gyllstad, 2011). Considering the proficiency levels of the participants in Experiment 2 and 3 based on their self-rated proficiency scores, official test scores, the vocabulary sizes provided with the help of a test conducted before the experiments, and the mean reaction times and the observed priming effect in the priming experiments, it may be assumed that the participants' lexical knowledge are roughly at the second stage of lexical development illustrated by Jiang (2000). At this stage, the L2 lexical items are linked to the conceptual representation not only directly via the L1 lemmas within their entries and via lexical links with their L1 translation. This modelling resembles the framework by Kroll and Stewart (1994). It must also be noted that a language user's L2 lexicon may contain words which are at different stages of development. For instance, as far as the collocational items in this study are concerned, some of the highly frequent collocations, which are entrenched in the mental lexicon of the L1 Turkish – L2 English bilinguals, can be considered at the third stage as they are stored as chunks and have very strong links with its conceptual representation without the facilitation of their Turkish translation. However, some others, which could be seen as the reason for the cross-linguistic collocational priming effect in the current study, may be at the second stage of development since there may still be robust links between these units in L2 and their Turkish counterparts. In other words, the activation of one may trigger the other and this interaction facilitates their connection to the conceptual representation level; that is to say, the conceptual representation of the L2 word is provided by means of L1. Figure 42 and 43 try to illustrate the last two stages of lexical development by Jiang (2000).

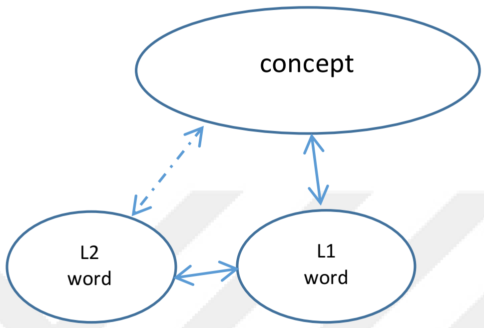

Figure 42 – 2nd Stage of Lexical Development

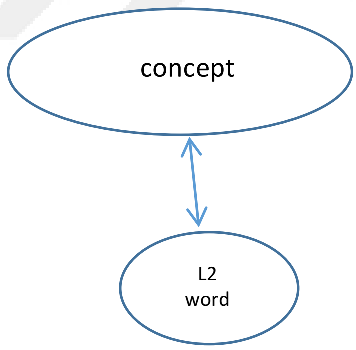

Figure 43 – 3rd Stage of Lexical Development

Another explanation could be that some incongruent collocations in English and Turkish (e.g. sağanak yağmur - heavy rain) may be at the third stage of lexical development because they are highly frequent in everyday use in the UK setting, in particular and thus it is highly salient. In addition to that, because they are incongruent, the L2 users in the UK (in Experiment 3) tend to switch between the Turkish and English version of incongruent member of the collocation [i.e. heavy (sağanak)–yağmur (rain)], which could lead to an entrenchment of those lexical items in L2-L1 direction in the mental lexicon. Therefore, the observed faster reaction times for incongruent ADJ+N collocations in L2-L1 direction in the UK setting can be attributed to the development stage of the lexical unit as well as the code-switching tendency of the language users due to the constraints caused by incongruence. As Bialystok (2009) states the most visible evidence of joint activation and/or conflict for selection by bilinguals is in code-switching. Research (e.g. Dijkstra, Grainger and van Heuven, 1999) suggests that for fluent bilinguals employing both languages regularly in its natural setting (as in the case of the subjects in Experiment 3), both languages are active and available when one of them is in use, which could help explain the different processing times in Experiment 2 and 3, the participants of which have different language exposure experiences. In addition, the degree of congruence is regarded as one of the earliest and the most widely accepted constraints on cross-linguistic transfer. This influence has been referred to as language distance, typological proximity and cross-linguistic difference in earlier research (e.g. Jarvis, 2000). The impact of cross-linguistic difference or similarity can be observed in various domains and it seems to affect lexical and collocational processing as well as other linguistic practices (Jarvis and Pavlenko, 2008).

From a cognitive linguistic perspective, the frequency of the collocations seems to play an important role in how entrenched they are in the mental lexicon and this entrenchment is likely to influence cross-linguistic activation at different grain sizes. As frequency reinforces the representation of linguistic items in memory, it facilitates the activation and processing of lexical items and constructions, which eventually can influence the organization of linguistic knowledge and the mental lexicon (Diessel, 2017). Entrenchment also seems to correlate with automated processing, which could indicate a more advanced use of certain lexical items. The fact that some collocations or formulaic expressions are congruent in L1 and L2 may help second language users internalize these phrases more easily and they are more readily available for them in spontaneous speech. Based on the results of the current research, it can be claimed that congruent collocations in L1 and L2 with high frequency are more likely to be entrenched earlier and at later stages of lexical development and representation. As far as acquiring a second or foreign language is concerned, the result of higher level of comprehension seems to be an enhanced level of learning. Higher levels of comprehension is possible through mentally matched and related linguistic forms in L1 and L2. To be more precise, acquiring a second language, similar to one's native language (e.g. in terms of typology) is likely to result in a facilitative learning experience and a processing advantage due to the fact that many of the forms and lexical units encountered in L2 will be analogous to the corresponding L1 lexical items. In the light of the discussion so far, it may be concluded that congruence and frequency are two major factors affecting cross-linguistic collocational processing. In addition, bilinguals being exposed to L2 in different contexts and at different lengths may process collocations in a different way and the way collocations are represented in their lexicon seems to differ.

5.3. IMPLICATIONS AND DIRECTIONS FOR FURTHER RESEARCH

The results of this study appear to bear a number of implications for further research and are likely to contribute to future studies investigating the organization of the bilingual mental lexicon, the factors affecting the cognitive processes behind the lexical activation in L1 and L2, and the psychological reality of collocations for native and second language users. Since the current study proved empirically that collocational priming exists in Turkish and that the activation is bidirectional, future research has to consider the fact that the phenomenon can be observed in typologically different languages and needs to build its methodology accordingly. Furthermore, as Experiment 2 and 3 proved that collocational priming can also be observed at the cross-linguistic level, those aiming to model cross-linguistic lexical access in the bilingual mental lexicon have to take collocation into account as well as cognates, translation equivalents etc. in their explanations. In addition, the effect of typology (i.e. syntactic-order based differences) on collocational processing in the bilingual mental lexicon has never been addressed through the windows of priming, so future studies exploiting lexical priming paradigm ought to consider typology as a promising variable affecting cross-linguistic lexical activation and shaping the way bilingual mental lexicon is organized. Moreover, the possible influence of exposure to L2 in its natural setting and the tendencies to codeswitch on mental lexicon organization, which have not been addressed by research investigating collocational processing, can be regarded as a major contribution. Therefore, future research should consider the relationship between the type of exposure to L2 and collocational processing in the bilingual mental lexicon besides proficiency. The methodological considerations of this research study can also guide other researchers in the field of psycholinguistics aiming to design a priming experiment with a lexical decision task. The procedures followed during the experimental process can also give them some ideas regarding the necessary steps to follow to control different variables. Because collocational priming has not been studied before from a cross-linguistic perspective, the priming script and the guidelines provided in the Appendices M, N and O can help researchers to replicate the research or manipulate the methodological variables to investigate the possible differences in the outcome. At its broadest sense, it can be claimed that collocational priming is a unique window into the cognitive processes in the bilingual mental lexicon during lexical activation and selection and it plays a significant role in the organization of the internal lexicon of bilinguals. As McEnery and Hardie (2011) state the lexicon, which is the mental inventory of meaningful linguistic signs, such as collocations, formulaic expressions and constructions, is the fundamental source of language competence. The grammar system is built on the internal lexicon and grammar and lexis are inextricably linked and interwoven.

With regard to some extensions in future psycholinguistic or cognitive linguistic research studies focusing on collocational priming, they should exploit more lexical items for each category employed in this study so that a stronger priming effect within each category can be observed. In addition, future research can integrate promising variables, such as proficiency and transparency levels of collocations into its investigation and explore the issue from a developmental perspective. The approach can also shed light on the possible influence of compositionality of collocations on the processing of word combinations cross-linguistically. Although it is claimed in this study that the exploited collocations were controlled for semantic association, future research can employ semantic associations as well as collocational frequency as possible indicators of response time in the priming experiment. There are examples in the priming literature exploiting semantic association as a separate variable (e.g. Durrant and Doherty, 2010), which could guide future studies. Furthermore, a different SOA can be employed in future research in an attempt to observe a possible priming effect under masked priming conditions. For instance, the comparison of a 50-millisecond, 100-millisecond and 150-millisecond SOAs may provide important insight into automatic and strategic priming of collocations cross-linguistically. Additionally, it should be noted that there may be some aspects of collocations which cannot be explained by frequency computed via corpora alone. For example, for language learners, the frequency reflected in BNC (British National Corpus) or COCA and what learners experience through the text books exploited throughout their language learning experience and how frequent they think a certain collocation is may not correlate. That's why advanced language users who have been exposed to those textbooks during their training can be consulted for their personal familiarity of these collocations and their intuition may indicate important outcomes for collocational processing. Native speakers' (Turkish and English) intuition can also be added into the analysis of the effect of familiarity on collocational processing when compared with frequency values of corpora in future research (see Siyanova-Chanturia and Spina, 2015 for a sample methodology). Last but not least, the cross-linguistic spreading activation of collocations and its possible influence on the internal structures of mental lexicon should be explored more comprehensively with the help of other cognitive methodologies in addition to the priming paradigm. Those methods are; eye tracking (see Roberts and Siyanova-Chanturia, 2013; Carrol and Conklin, 2014 for a review on the use of eye-tracking to explore lexical processing) and neuroimaging (see Henson, 2003 for a review of neuroimaging studies of priming).

The design of the experiments in this study has a psycholinguistic approach assisted by corpus linguistic tools. The lexical items exploited have been extracted from two balanced corpora with their frequency values and their psycholinguistic reality has been tested through an online psycholinguistic method, ‘priming’. The interpretations and the underlying theory are cognitive based since they see language processing as a general cognitive process rather than a unique cognitive system. Therefore, it can be said that in addition to shedding light on the organization of bilingual mental lexicon from a collocational perspective, the current study with its interdisciplinary nature, integrating the fields of psychology, cognitive sciences, linguistics and language acquisition, has the potential to reach experts from different fields and is likely to raise interest with its multidimensional approach, the result of which could generate more projects with research members from different fields of research. For instance, though it is beyond the scope of this research, priming has the potential to reflect socially constructed schemas, resulting from our embodied cognition and can help understand how these schemas are constructed and how they shape the way we see the world. Collocates and nodes begin to prime each other in the mental lexicon as they are frequently encountered in every day life and their co-occurence becomes more entrenched in time due to their salience in social environments. Corpus-assisted discourse analytic studies suggest that if collocations and fixed expressions are repeatedly used as unanalysed units in media discussion, for instance, then it is very plausible that people come to think of things in such terms. In other words, social reality is reconstructed through the use of collocations and people are primed to think of certain concepts as they are presented to them; e.g. considering ‘migration’ as something ‘illegal’ (Stubbs, 1996). To be more precise, they are framed in such a way in dominant discourse and become so salient that the concept begins to trigger and prime negative connotations in people’s minds. Therefore, one can tentatively state that the results and the methodology of this study can give subtle hints to those investigating cognitive processes in the human mind and human behaviours (e.g. psychologists) as well as linguists examining social or discoursal aspects of language use.

One of the primary aims of this study has been to raise interest in research investigating lexical processing and collocational priming in a typologically different language, Turkish. Future studies in the domain of lexical processing in Turkish have the potential to approach the theories of language use, mainly built on the English language, from the eyes of a language underrepresented in the related literature. A secondary aim of the study was to indirectly illuminate some issues regarding English language teaching and the results may provide some implications for both first and second language acquisition and learning. The writer of this research, a linguist and a language teaching expert himself, was primed to study lexical processing in the bilingual mental lexicon based on his observations in the language classrooms in the UK and Turkey. He got interested in the issue of collocational priming during his analysis of common collocational errors in L2 writing and their cognitive reasons. Therefore, it was thought that this study, having its basic inspiration in foreign and second language teaching, should feed into the language teaching context by looking at the issue from a cognitive and psycholinguistic perspective like any other linguistic oriented research, the results of which can provide some insights into second/foreign language teaching methods and language acquisition.

Ellis (2001) posits that first language learners go through a chunk formation process when acquiring collocations. That is to say, when a learner encounters a lexical item together with its combination, they are likely to become associated in the mental lexicon. Therefore, when one of them is seen again, the learner remembers the associated following lexical item. The ‘Law of Contiguity’, as he names it, enables the combination to be represented in the long-term memory and retrieved as a chunk. The chunking of these co-occurring patterns is performed implicitly (i.e. without conscious consideration). On the other hand, Wray (2002) claims that in spite of exploiting a certain number of formulaic expressions (e.g. collocations) easily at an earlier period of learning, adult second language learners in particular have the tendency to employ fewer of them as they get more proficient. According to her, the way second language users and native speakers process collocations is fundamentally different. Wray (2002) further claims that there are two main reasons for the different of use of collocations by L1 and L2 users, which are social and cognitive. As far as the social aspect is concerned, L2 users (in a classroom setting, in particular) hardly feel the necessity to communicate as much as L1 users do in a natural setting, which is probably why they don't memorize or pay attention to fixed expressions, such as collocations that could help them in their fluency. This tendency is also supported by traditional teaching methods, which mainly concentrate on grammar rules and memorization of single words with L1 translations. From a cognitive perspective, L2 users have the potential to explore the single units of a formulaic expression by decomposing them into their bits rather than waiting for the knowledge of the expression to accumulate up to a point where every aspect of its senses is comprehended and it is internalized as a chunk due to their advanced L1 language system and their L2 learning experience. Likewise, some other second language theoreticians (e.g. Krashen and Scarcella, 1978) have supported the idea that formulaic language (and 'collocation' as a subcategory) is a device for elementary learners and due to its temporary nature, it is likely to be replaced by more novel and creative constructions as the learners gain proficiency. However, it is asserted by some others that (e.g. Schmitt, 2010) collocations play a key role in language processing and that they are major components of language pedagogy. Kjellmer (1990) investigating the issue of high frequency collocations from a broader perspective attaches formulaic language and collocations a key importance. He states that collocations are ubiquitous in L1 production in particular and that native language is full of prefabricated phrases. The L2 users, on the other hand, need to construct novel structures although they may have a certain number of fixed expressions like collocations in their production, which is likely to result in a failure to form native-like sentences. Kjellmer's remarks may indicate that learning formulaic expressions can lead to native-like production. In other words, one might think that the more formulaic expressions are exploited by L2 users, the more native-like their production will be. There are some studies validating this claim. For instance, Cortes (2004) claims that there is a negative correlation between the use of collocations and fixed expressions and language proficiency. Nesselhauf (2005) also posits that there is a relationship between the number of collocations exploited in language production and language proficiency. To be more precise, the more proficient a language learner is, the more collocations he/she is expected to use or vice-versa. Accepting this relationship as it is may prevent us from seeing the whole picture. Although it is acceptable that L2 users learn more formulaic expressions in time and employ them in their production, relying on formulaic language excessively might also indicate a non-native type of language use. Looking at the issue from a pedagogical perspective, one can see that one of the prominent and effective teaching approaches is communicative language teaching whose theoretical roots rest in Hymes' (1972) 'communicative competence' underlining the mastery of what is appropriate in a social context and what is feasible considering our psycholinguistic boundaries. The approach promotes formulaic language use (and collocations in that sense) stating that linguistic competence involves the control of both grammar and some fixed expressions. Schmitt (2010) also states that L2 learners ought to be encouraged to pick up collocations implicitly by means of intensive exposure to the target language due to the fact that collocations have a profoundly contextualized character. In the light of the discussion regarding the importance of collocations for language acquisition and second language learning and factors affecting collocatinal processing, such as congruence and frequency, it can be concluded that more attention needs to be paid to the collocations having no equivalence in language users' first and second language in the EFL/ESL classroom as the foreign language learners are not as lucky as the subjects of the 3rd Experiment, who had a language input in its natural setting. It can also be claimed that incongruent collocations are unlikely to be acquired by incidental exposure alone since new conceptual domains needs to be structured in the internal lexicon and this may require special attention. It is possible to see the influence of incongruent collocations in Turkish and English even in advanced second language users' mistakes (e.g. do a mistake, strong rain etc.). You can find the reasons of this L1 reliance and ignorance in the use of collocations or chunks in the way language users receive their language education, in which no attention is paid to the idea of congruence in collocations, for instance. The Lexical Approach (Lewis, 1993) addresses this problematic issue and builds on the idiom principle by Sinclair (1991), emphasizing the instruction of relatively fixed expressions, such as collocations that are frequent in the target language. A pedagogical implication that can be drawn from the finding is that incongruent collocations may require more attention during vocabulary teaching in EFL and ESL classrooms (Ellis et al., 2008).

All the corpus linguistic theories, such as Pattern Grammar and Construction Grammar regard lexicons as the chief component of language. Both neo-Firthian theory and functional cognitive linguistics consider language production as connecting lexical items (e.g. collocations, constructions etc.) together to have a meaningful whole. On the whole, one can argue in the light of the approaches (e.g. emergentist view of language acquisition) discussed so far and based on the results of the current research, language ought to be considered not as a set of grammar rules, but a statistical amassing of experiences that alters each time a specific utterance is encountered (Ellis, 2002a). This stance suggests faster processing of all frequent words or expressions than less frequent or infrequent ones and seems to be in line with connectionist views of language acquisition and processing that underline statistical features of the input in language acquisition (Christiansen and Chater, 1999). The connectionist approach posits that units do not exist in isolation, but they form networks with one another and the frequency of their co-occurrence seems to determine how strong the connection is between these units. In other words, these networks determine how speakers acquire lexicon and how these lexical units are represented in the mental lexicon. If one looks at the issue from a pedagogical perspective, it must be underlined that as Wray (2002) argues, learners tend to ignore collocational relationships or are not aware of their existence even in their native language. Therefore, what teachers need to do is to raise awareness regarding formulaic language use, collocations in particular, and make these relationships more salient and explicit. It must be added that there is a growing interest in the teaching and learning of formulaic language. Observations regarding the role of memorized sequences in native language production, their effect on fluency, the observed patterns in native written and spoken productions with the help of corpora, and studies emphasizing the importance of frequency on language processing have raised awareness about the need to teach formulaic expressions, such as collocations to L2 users. As a way to raise that awareness, it can be claimed that corpora need to be exploited in language teaching as it enables exposure to authentic data. Corpus-assisted language learning and the use of digital corpus-based learning resources for English language teaching appear to have cognitive benefits as the learners have the opportunity to be exposed to natural language patterns, such as collocations (like the participants in Experiment 3), which in turn allows for implicit acquisition and more fluency (i.e. faster collocational processing or processing units as chunks) eventually (Gablasova, 2018). Discovering patterns in naturally occurring language has also cognitive benefits as learners need to engage more with the instances of language indicating certain patterns and they generalize from their observations like they do in first language acquisition. Johns (1991) identifies three stages of inductive reasoning with the help of corpora in the ‘Data Driven Learning’ approach: observation of concordance evidence (and detecting frequency), classification of salient features (e.g. surrounding lexical units), and generalization of rules. Therefore, it can be implied that the findings of this study underlining the importance of frequency and language exposure seem to support the corpus-assisted second language acquisition approach in that corpora provide an opportunity for learners to experience naturally occurring language. With the help of this approach, learners can experience discovery learning which can be claimed to be the basis of native language acquisition. That is to say, corpus-assisted learning experience can enhance the spreading activation of lexical items in the L2 mental lexicon; namely strengthen the collocational links, and helps learners internalize natural language instances in context. Therefore, it can be stated that as L2 users are exposed to native language more often, the collocational links in the mental lexicon strengthen enabling stronger lexical priming which sets the base for our creative language system (Hoey, 2005). Collocational priming is a phenomenon observed in L1 (as has been proven in Experiment 1) and it can be observed in L2 lexical processing, as well. Last but not least, the effect of language exposure should be emphasized since it was one of the variables exploited in the current study. It is believed that language exposure, frequency of language use, and the setting in which you have the target language input are crucial factors in target language restructuring. At the initial stages of the L2 learning process, no target language restructuring is observed and the language users continue to rely on the patterns in their native language. As the language users gain proficiency and they face incongruent patterns in L1 and L2, restructuring begins in an attempt to accommodate the newly observed and divergent patterns of the target language. Earlier studies have shown that foreign language learning in the classroom setting is likely to constrain cognitive restructuring. On the other hand, immersion in the L2 setting appears to facilitate automaticity and processing due to the stronger links between the words in the mental lexicon (Pavlenko, 2014). Although one of the assumptions of the current study was a stronger priming effect in the UK setting where the participants had been living in the UK for at least two years, the empirical evidence did not reflect any significant results. However, the differences between mean response times of collocate and noncollocate items in two different experiments (i.e. two different language exposure settings) appear to reflect certain variations in processing times, especially for V+N collocations.

In short, the findings of this research innovatively revealed with the help of a typologically different language (i.e. Turkish) that collocational priming is psychologically real and it can be observed at the cross-linguistic level. It seems to play an important role in how the bilingual mental lexicon is structured, so models of bilingual mental lexicon to be proposed in the future may need to consider collocational links during lexical activation. In addition, the findings indicated that priming asymmetry was valid not only for cognates, translation equivalents, and semantically related lexical items but also for collocations in the bilingual mental lexicon, which should be seen as a major contribution to the background knowledge in priming research. Last but not least, the length of L2 exposure and code-switching tendencies were presented as new variables that were not exploited in collocational priming research before. It was tentatively claimed that language exposure and code-switching appeared to influence the structuring of the bilingual mental lexicon as much as language proficiency. The effect of congruence and frequency on collocational processing, an argument put forward by earlier research, was also consolidated and the influence was revealed from a cross-linguistic perspective, which can be seen as another stepping stone in the related literature.

CHAPTER 6
CONCLUSION

The idea of 'priming' by Hoey (2005), which has its roots in cognitive linguistics and emergentist views of language, is a psycholinguistic phenomenon and it contributes to neo-Firthian theory by regarding the notion of collocation as a psycholinguistic reality. Furthermore, connectionist-oriented earlier research exploring probabilistic effects in language processing seems to be in line with Hoey's claims in that language competence is seen as a network of lexical units employed in language production and perception. Hoey (2005) depicts language competence as a mental concordance. He states that there is a mental concordance in the human mind consisting of all the words encountered. This mental concordancer resembles a computer concordancer in that it is easily accessible and can be processed in order to retrieve the necessary patterns like collocations to be used in spontaneous speech. This notion of acquisition is also presented in psycholinguistic research stating that speakers of a certain language possess a huge amount of frequency information available just like a corpus. Built on and extending Hoey's collocational priming theory, the current study attempted to explore the existence of collocational priming in a typologically different language.

The results of the first experiment showed that collocational priming existed in Turkish and that collocational as well as single word frequency was playing a crucial role in the process. Since the first experiment was the preliminary step of the second and third experiments, the exploited items were presented in V+N order in the priming task although the regular word in Turkish is N+V. The fact that a priming effect was detected regardless of the irregular word order and that ΔP had an influence in processing in both directions, it was deduced that the activation of the items were bidirectional and the collocational priming effect for V+N lexical items were attributed to the flexible nature of the Turkish word order particularly in spontaneous language use. Furthermore, Experiment 2 and

3 sought to investigate cross-linguistic collocational priming in the bilingual mental lexicon and scrutinized the possible influence of frequency, syntactic-order based differences, congruence, and language exposure on collocational processing. The results of the second experiment indicated that there was cross-linguistic collocational priming in the L1 Turkish-L2 English bilingual mental lexicon for ADJ+N collocate items. The same effect could not be observed for V+N items, which was assumed to stem from the typological (i.e. syntactic-order based) difference between Turkish and English. Congruence effect in collocational processing was also detected as the congruent items revealed stronger priming effects, on the whole. The results also validated the priming asymmetry put forward by earlier research (Jiang and Forster, 2001) by indicating a more robust priming effect in L1-L2 direction. It was deduced based on the results of Experiment 3 that there was a relationship between the type of exposure to L2 and cross-linguistic collocational priming as some distinct tendencies in terms of how collocations were processed were observed when the output from Experiment 2 and 3 were compared. It was deduced based on the varying patterns of cross-linguistic collocational priming that the co-activation of languages (i.e. language non-selective access) was assumed to be the underlying cognitive process which makes code-switching possible: If both languages were not activated simultaneously (i.e. if language access was selective) during language production, it would not be possible to explicate the processing advantage many bilinguals enjoy while switching between their languages (Kootstra, 2015). The same was true when the performance of the participants in Experiment 2 and 3 were compared. Due to the frequency of L2 use in its natural setting and being exposed to the input full of collocations and formulaic expressions, the participants of Experiment 3 who are also obliged to codeswitch more often than the participants in Experiment 2 to compensate for the conceptually dissimilar lexical items in a collocation or a chunk of language performed differently in the cross-linguistic priming experiment.

One of the main aims of this study was to model the bilingual mental lexicon from a cross-linguistic perspective within the domain of collocations, in particular, with the help of the bilingual mental lexicon frameworks proposed earlier. Although several models were employed to account for various phenomenon observed in the priming experiment findings, the dominant model; that is the one that the observed patterns best fits into was “Spreading Activation Model” (Collins and Loftus, 1975). The notion of inhibition put forward mainly by BIA+ model (Dijkstra and van Heuven, 2002) was used to explain the effect of typology and incongruence on collocational processing; however, what is meant by ‘inhibition’ was the factors preventing spreading activation rather than a complete system of lexical processing as addressed by other researchers. In addition, the study sought to look beyond the assertions by Hoey (2005) and investigate the idea of collocational priming from a different angle by investigating a typologically different language. Last but not least, the study attempted to address some of the underlying factors playing a crucial role in language acquisition and lexical processing. The results of the three experiments within this scope may indicate a language non-specific lexical activation process and prove the notion of collocational priming from a different perspective. The current research embraces the idea that priming is the basis of our creative language system and holds an emergentist view of language acquisition and processing, which suggests that language knowledge is a product of our embodied cognition and is formed through our experiences with the linguistic patterns we encounter during language comprehension and production and that our language competence is shaped by dint of our generalizations of these patterns. The results may well give an important insight into the modelling of bilingual mental lexicon which could guide applied linguists and language specialists in terms of the teaching methods to be applied based on the underlying processes in the bilingual cognition. The effect of frequency and congruence may illuminate the cross-linguistic nature of the mental lexicon and explain two of the contributing factors to the organization of the mental lexicon. Moreover, the continuing effect of L1 on L2 in L1 Turkish-L2 English bilinguals appears to illustrate the major cognitive processes behind lexical activation and selection in the bilingual brain.

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APPENDICES

APPENDIX A: Language History Questionnaire (sample page)

Dil Geçmişi Anketi (LHQ 2.0)

ID numarası: 100

1. Yaş:

2. Cinsiyet: Erkek Kadın

3. Eğitim durumu: Eğitim durumu...

4. Hiç dinleme, konuşma, okuma ya da yazma amacıyla ikinci bir dil öğrendiniz ya da ikinci bir dilde eğitim gördünüz mü? Evet Hayır

5. Lütfen anadil(ler)inizi ve bildiğiniz diğer dilleri, bu dillerde dinleme, konuşma, okuma ve yazmaya kaç yaşında başladığınızı, ve her bir dili toplamda kaç yıl kullandığınızı belirtiniz.

Dil:	Dinleme:	Konuşma:	Okuma:	Yazma:	Kullanım süresi:
Dil...					yıl
Dil...					yıl
Dil...					yıl
Dil...					yıl

6a. Şu anda yaşamakta olduğunuz ülke: Ülke... 6b. Uyruğunuz: Ülke...

6c. Eğer 6a ve 6b'ye verdiğiniz cevaplar farklı ise, şu anda yaşamakta olduğunuz ülkeye ilk ne zaman taşındınız?

7. Eğer şu anda yaşamakta olduğunuz ya da uyruğunuzun bulunduğu ülkeden farklı bir yerde üç aydan fazla yaşadıysanız ülkenin adını, ikamet sürenizi, bu sürede kullandığınız dili ve bu dili kullanım sıklığınızı her ülke için belirtiniz.

Ülke:	İkamet süresi:	Dil:	Kullanım sıklığı:
Ülke...	ay	Dil...	Derecelendirin...
Ülke...	ay	Dil...	Derecelendirin...
Ülke...	ay	Dil...	Derecelendirin...
Ülke...	ay	Dil...	Derecelendirin...

8. Bildiğiniz veya eğitim gördüğünüz dilleri kullanmaya başladığınız yaşı aşağıdaki her ortam için ayrı ayrı belirtiniz.

Dil:	Evde:	Arkadaşlarla:	Okulda:	İşte:	Dil öğrenme programında:	Online oyunlarda:
Dil...						
Dil...						
Dil...						
Dil...						

9. Her eğitim seviyesi için öğretmenlerinizin kullandığı eğitim dilini belirtiniz. Eğer herhangi bir eğitim seviyesi içinde eğitim dilinde bir dilden diğerine geçiş yaşandıysa bunu "Geçilen dil" kısmında belirtiniz.

	Dil:	(Geçilen dil:)
İlkokul:	Dil...	Dil...
Ortaokul:	Dil...	Dil...
Lise:	Dil...	Dil...
Üniversite:	Dil...	Dil...

10. Dil öğrenme becerinizi derecelendirin. Yeni bir dil öğrenme konusunda arkadaşlarınıza ya da tanıdığınız diğer insanlara kıyasla kendinizi ne kadar iyi hissedersiniz? Derecelendirin...

11. Bildiğiniz veya eğitim gördüğünüz her dil için şu anki dinleme, konuşma, okuma ve yazma becerilerinizi derecelendirin.

Dil:	Dinleme:	Konuşma:	Okuma:	Yazma:
Dil...	Derecelendirin...	Derecelendirin...	Derecelendirin...	Derecelendirin...
Dil...	Derecelendirin...	Derecelendirin...	Derecelendirin...	Derecelendirin...
Dil...	Derecelendirin...	Derecelendirin...	Derecelendirin...	Derecelendirin...
Dil...	Derecelendirin...	Derecelendirin...	Derecelendirin...	Derecelendirin...

12. Bugüne kadar herhangi bir standart dil seviye belirleme testine girdiyseniz (örn. TOEFL) aldığınız her bir test için test adını, test edilen dili ve elde ettiğiniz puanı belirtiniz. Eğer tam puanınızı hatırlamıyorsanız "Yaklaşık puan" bölümüne tahmini bir skor yazınız.

Test:	Dil:	Puan:	(Yaklaşık puan:)
	Dil...		
	Dil...		
	Dil...		
	Dil...		

APPENDIX B: Vocabulary Size Test

(sample from https://www.victoria.ac.nz/lals/about/staff/paul-nation)

Vocabulary Size Test[1]

Circle the letter a-d with the closest meaning to the key word in the question.

1. SEE: They **saw** it.
   a. cut
   b. waited for
   c. looked at
   d. started

2. TIME: They have a lot of **time**.
   a. money
   b. food
   c. hours
   d. friends

3. PERIOD: It was a difficult **period**.
   a. question
   b. time
   c. thing to do
   d. book

4. FIGURE: Is this the right **figure**?
   a. answer
   b. place
   c. time
   d. number

5. POOR: We are **poor**.
   a. have no money
   b. feel happy
   c. are very interested
   d. do not like to work hard

6. DRIVE: He **drives** fast.
   a. swims
   b. learns
   c. throws balls
   d. uses a car

7. JUMP: She tried to **jump**.
   a. lie on top of the water
   b. get off the ground suddenly
   c. stop the car at the edge of the road
   d. move very fast

8. SHOE: Where is your **shoe**?
   a. the person who looks after you
   b. the thing you keep your money in
   c. the thing you use for writing
   d. the thing you wear on your foot

9. STANDARD: Her **standards** are very high.
   a. the bits at the back under her shoes
   b. the marks she gets in school
   c. the money she asks for
   d. the levels she reaches in everything

10. BASIS: This was used as the **basis**.
   a. answer
   b. place to take a rest
   c. next step
   d. main part

Second 1000

1. MAINTAIN: Can they **maintain** it?
   a. keep it as it is
   b. make it larger
   c. get a better one than it
   d. get it

2. STONE: He sat on a **stone**.
   a. hard thing
   b. kind of chair
   c. soft thing on the floor
   d. part of a tree

3. UPSET: I am **upset**.
   a. tired
   b. famous
   c. rich
   d. unhappy

4. DRAWER: The **drawer** was empty.
   a. sliding box
   b. place where cars are kept
   c. cupboard to keep things cold
   d. animal house

5. PATIENCE: He has no **patience**.
   a. will not wait happily
   b. has no free time
   c. has no faith
   d. does not know what is fair

6. NIL: His mark for that question was **nil**.
   a. very bad
   b. nothing
   c. very good
   d. in the middle

7. PUB: They went to the **pub**.
   a. place where people drink and talk
   b. place that looks after money
   c. large building with many shops
   d. building for swimming

8. CIRCLE: Make a **circle**.
   a. rough picture
   b. space with nothing in it
   c. round shape
   d. large hole

9. MICROPONE: Please use the **microphone**.
   a. machine for making food hot
   b. machine that makes sounds louder
   c. machine that makes things look bigger
   d. small telephone that can be carried around

10. PRO: He's a **pro**.
   a. someone who is employed to find out important secrets
   b. a stupid person
   c. someone who writes for a newspaper
   d. someone who is paid for playing sport etc

Third 1000

1. SOLDIER: He is a **soldier**.
   a. person in a business
   b. student
   c. person who uses metal
   d. person in the army

2. RESTORE: It has been **restored**.
   a. said again
   b. given to a different person
   c. given a lower price
   d. made like new again

3. JUG: He was holding a **jug**.
   a. A container for pouring liquids
   b. an informal discussion
   c. A soft cap
   d. A weapon that explodes

4. SCRUB: He is **scrubbing** it.
   a. cutting shallow lines into it
   b. repairing it
   c. rubbing it hard to clean it
   d. drawing simple pictures of it

5. DINOSAUR: The children were pretending to be **dinosaurs**.
   a. robbers who work at sea
   b. very small creatures with human form but with wings
   c. large creatures with wings that breathe fire
   d. animals that lived a long time ago

6. STRAP: He broke the **strap**.
   a. promise
   b. top cover
   c. shallow dish for food
   d. strip of material for holding things together

7. PAVE: It was **paved**.
   a. prevented from going through
   b. divided
   c. given gold edges
   d. covered with a hard surface

8. DASH: They **dashed** over it.
   a. moved quickly
   b. moved slowly
   c. fought
   d. looked quickly

9. ROVE: He couldn't stop **roving**.
   a. getting drunk
   b. travelling around
   c. making a musical sound through closed lips
   d. working hard

10. LONESOME: He felt **lonesome**.
    a. ungrateful
    b. very tired
    c. lonely
    d. full of energy

Fourth 1000

1. COMPOUND: They made a new **compound**.
   a. agreement
   b. thing made of two or more parts
   c. group of people forming a business
   d. guess based on past experience

2. LATTER: I agree with the **latter**.
   a. man from the church
   b. reason given
   c. last one
   d. answer

3. CANDID: Please be **candid**.
   a. be careful
   b. show sympathy
   c. show fairness to both sides
   d. say what you really think

4. TUMMY: Look at my **tummy**.
   a. cloth to cover the head
   b. stomach
   c. small furry animal
   d. thumb

5. QUIZ: We made a **quiz**.
   a. thing to hold arrows
   b. serious mistake
   c. set of questions
   d. box for birds to make nests in

6. INPUT: We need more **input**.
   a. information, power, etc. put into something
   b. workers
   c. artificial filling for a hole in wood
   d. money

7. CRAB: Do you like **crabs**?
   a. sea creatures that walk sideways
   b. very thin small cakes
   c. tight, hard collars
   d. large black insects that sing at night

8. VOCABULARY: You will need more **vocabulary**.
   a. words
   b. skill
   c. money
   d. guns

9. REMEDY: We found a good **remedy**.
   a. way to fix a problem
   b. place to eat in public
   c. way to prepare food
   d. rule about numbers

10. ALLEGE: They **alleged** it.
    a. claimed it without proof
    b. stole the ideas for it from someone else
    c. provided facts to prove it
    d. argued against the facts that supported it

APPENDIX C: Informed Consent Form - Gönüllü Katılım Formu (Online olarak uygulanmıştır)

Bu araştırma, Öğr. Gör. Hakan CANGIR tarafından Hacettepe Üniversitesi'nde Prof. Dr. Nalan Büyükkantarcıoğlu danışmanlığında ve Exeter Üniversitesi öğretim üyesi Dr. Philip Durrant mentorluğunda devam eden Doktora tez çalışması kapsamında yürütülmektedir. Çalışmanın amacı, iki dillilerin zihin sözlüklerinin nasıl şekillendiği, birinci ve ikinci dildeki eşdizimli kelimelerin diller arası etkileşiminin olup olmadığı gibi sorulara cevap bulmaktır. Çalışma, Hacettepe Üniversite'si Etik Komisyonu tarafından onaylanmıştır ve bu araştırmaya katılım tamamıyla gönüllülük temeline dayanmaktadır. Dil geçmişi anketi, önceleme deneyi ve bilişsel yeterlik uygulamalarında, sizden kimlik belirleyici hiçbir bilgi istenmemektedir. Cevaplarınız tamamiyle gizli tutulacak, sadece araştırmacı tarafından değerlendirilecek ve elde edilecek bilgiler yalnızca doktora tez çalışması kapsamında kullanılacaktır.

Araştırma kapsamında uygulanacak anket ve testler, genel olarak kişisel rahatsızlık verecek soruları içermemektedir. Ancak, katılım sırasında sorulardan ya da herhangi başka bir nedenden ötürü kendinizi rahatsız hissederseniz cevaplama işini yarıda bırakıp çıkmakta serbestsiniz. Böyle bir durumda anketi ya da testi uygulayan kişiye, anketi ya da testi tamamlamadığınızı söylemek yeterli olacaktır. Uygulama sonunda, bu çalışmayla ilgili sorularınız cevaplanacaktır. Çalışma hakkında daha fazla bilgi almak için Öğr. Gör. Hakan CANGIR ile iletişim kurabilirsiniz. Bu çalışmaya katıldığınız için şimdiden teşekkür ederiz

Bu çalışmaya tamamen gönüllü olarak katılıyorum ve istediğim zaman yarıda kesip çıkabileceğimi biliyorum. Verdiğim bilgilerin bilimsel amaçlı yayımlarda kullanılmasını kabul ediyorum. (Formu doldurup imzaladıktan sonra uygulayıcıya geri veriniz).

İsim - Soyadı	Tarih	İmza
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APPENDIX D: Frequency Values of the English&Turkish Collocations

VERB +NOUN	English	*t*	MI	$\Delta P_{1\|2}$	$\Delta P_{2\|1}$
Congruent					
1	make mistake	42,94	8,51	0,014953449	0,078321846
2	give permission	12,02	6,86	0,00236876	0,013425377
3	take pleasure	14,57	5,49	0,001807796	0,010009446
4	find solace	7,26	8,28	0,000877282	0,034547488
5	show affection	4,91	5,77	0,000535092	0,004702962
6	take breath	30,57	7,04	0,007796552	0,029196863
7	find solution	8,41	4,59	0,001224894	0,002656587
8	commit murder	8,76	8,92	0,029071678	0,00238207
9	give priority	10,67	6,21	0,001876889	0,00853839
10	make a discovery	6,76	3,8	0,000403672	0,003008236
11	find clue	3,41	4,23	0,000204509	0,002050976
12	break heart	10,67	6,19	0,013696589	0,001152483
13	open fire	10,09	4,71	0,003374687	0,001512258
14	win victory	5,17	5,48	0,002417046	0,000949924
15	pass time	12,96	3,47	0,015755437	0,000222198
	MEAN	12.61	5.97	0.006424	0.01284514
VERB +NOUN	**English**	***t***	**MI**	$\Delta P_{1\|2}$	$\Delta P_{2\|1}$
Non-congruent					
1	make decision	33,45	6,11	0,009233332	0,0156404
2	pay attention	49,84	9,47	0,104000797	0,028313632
3	cast doubt	12,67	9,55	0,028911977	0,00773745
4	go bankrupt	8,57	8,03	0,000443861	0,076603936
5	take break	31,44	6,52	0,008265974	0,020539947
6	feel the need	22,50	5,86	0,005844162	0,00948632
7	put pressure	21,44	6,15	0,007396029	0,008343645
8	lose weight	24,84	8,77	0,042349862	0,011599051
9	pay visit	9,84	6,55	0,004550739	0,003812893
10	shed light	16,86	9,84	0,160716094	0,002600476
11	set example	10,68	5,56	0,003619212	0,002848874
12	grow beard	4,65	6,80	0,001550665	0,00297355
13	have accident	19,04	3,52	0,000425646	0,018360225
14	place emphasis	14,51	8,05	0,009269658	0,011301988
15	keep secret	12,47	5,63	0,00291637	0,005029558
MEAN		12.67	9.55	0.025966	0.015012796
ADJ+NOUN	**English**	***t***	**MI**	$\Delta P_{1\|2}$	$\Delta P_{2\|1}$
Congruent					
1	deep sleep	24,6	8,02	0,013218204	0,022015832
2	cold war	97,79	8,83	0,147657522	0,045915829

3	outside world	51,35	7,39	0,108934714	0,006902828
4	strong evidence	33,97	6,36	0,013440258	0,013162905
5	naked eye	27,68	9,08	0,054786019	0,013572644
6	warm welcome	16,87	7,98	0,008418423	0,016052513
7	bitter end	16,49	6,29	0,02557861	0,001549696
8	heated debate	21,57	10,61	0,115663859	0,010575405
9	rich history	24,53	5,79	0,014992152	0,004190669
10	golden age	38,18	7,86	0,051937569	0,011765557
11	middle class	88,86	9,67	0,125738072	0,079207733
12	opposing view	11,57	7,83	0,033222998	0,001702489
13	high court	40,28	4,96	0,007069477	0,013485761
14	undying love	9,05	10,86	0,238203793	0,00093543
15	white lie	10,69	5,67	0,000727876	0,015150654
MEAN		45.99	7.82	0.0639726	0.017079063
ADJ+NOUN	**English**	***t***	**MI**	**$\Delta P_{1\|2}$**	**$\Delta P_{2\|1}$**
Non-congruent					
1	open mind	27,58	5,65	0,008695705	0,008286854
2	long run	66,90	8,26	0,025195843	0,092411173
3	heavy rain	28,42	8,30	0,017524266	0,026711601
4	thick smoke	20,66	8,66	0,015903025	0,020063485
5	wiry hair	12,02	9,39	0,105817785	0,001575931
6	strong smell	13,72	6,36	0,002218271	0,013160177
7	false tooth	14,16	8,07	0,011757254	0,008607707
8	strong coffee	16,64	5,55	0,003287062	0,007494816
9	soft drink	23,68	8,93	0,016696734	0,030093322
10	driving force	36,87	9,93	0,121345868	0,018095171
11	tall building	14,69	5,78	0,007798496	0,002895401
12	high achievement	19,33	5,25	0,001627117	0,016442226
13	sharp fall	6,11	4,44	0,001911764	0,000811982
14	drastic change	14,73	8,89	0,076964655	0,002368471
15	free rein	16,84	10,69	0,002548142	0,260336847
MEAN		13.385	6.55	0.0279528	0.033957011

NOUN+VERB	**Turkish**	***t***	**MI**	**$\Delta P_{1\|2}$**	**$\Delta P_{2\|1}$**
Congruent					
1	hata yap-	4.796	5.191	0,292765523	0,095936154
2	izin ver-	10.343	6,32	0,37098396	0,433633656
3	keyif al-	4,122	6,636	0,470389542	0,091525406
4	huzur bul-	3,741	6.497	0,237770425	0,175657823
5	şefkat göster-	2.449	7.282	0,276496757	0,11335695
6	nefes al-	9.218	7.131	0,558288908	0,334987226

7	çözüm bul-	11.532	8.218	0,504397958	0,669348166
8	cinayet isle-	3.162	10,82	0,282166965	0,720460586
9	öncelik ver-	4.122	6.426	0,390173932	0,108452419
10	keşif yap-	2.645	5.478	0,34179254	0,031286045
11	ipucu bul-	2.449	7.139	0,324849796	0,083681759
12	kalp kır-	1.414	11.648	0,028105495	0,179693136
13	ateş aç-	3.317	6,28	0,101578556	0,290618926
14	zafer kazan-	3.162	7.227	0,207726815	0,236294133
15	zaman geçir-	7.681	4.487	0,036214354	0,652479104
MEAN		4.94	6.94	0.2949134	0.2811608
NOUN+VERB	**Turkish**	***t***	**MI**	**$\Delta P_{1\|2}$**	**$\Delta P_{2\|1}$**
Non-congruent					
1	karar ver-	19.897	7.193	0,522417754	0,739143483
2	dikkat et-	16.211	5.614	0,492889522	0,41180719
3	şüphe uyandır-	2.414	8.984	0,076952615	0,401605946
4	iflas et-	3.317	4.953	0,37644697	0,028449874
5	ara ver-	7.809	5.642	0,27139781	0,303857248
6	ihtiyaç duy-	3.162	6.331	0,075952822	0,338521602
7	baskı yap-	5,29	4,732	0,23232225	0,114405276
8	kilo ver-	7.279	7.345	0,539987017	0,274966672
9	ziyaret et-	12,123	6,531	0,648598206	0,281262757
10	ışık tut-	5.099	6.609	0,161731026	0,41022135
11	örnek ol-	9.429	3.951	0,304356372	0,141677324
12	sakal bırak-	2.236	8.845	0,394321237	0,158881321
13	kaza yap-	2.449	3.622	0,123477863	0,026936384
14	vurgu yap-	4,69	6.919	0,581237409	0,09215014
15	sır sakla-	2.44	9.161	0,182648259	0,456620468
MEAN		7.53	6.42	0.3323158	0.2787005
ADJ+NOUN	**Turkish**	***t***	**MI**	**$\Delta P_{1\|2}$**	**$\Delta P_{2\|1}$**
Congruent					
1	derin uyku	8,716	7,424	0,311793861	0,600597246
2	soğuk savaş	23,89	8,602	0,817204368	0,72915081
3	dış dünya	19,041	5.245	0,536684682	0,381849785
4	kuvvetli delil	4.123	9.021	0,288135319	0,553564774
5	çıplak göz	3.741	4.143	0,222039982	0,044491487
6	sıcak karşılama	2.645	6.511	0,04321769	0,423982364
7	acı son	8.123	3.053	0,320584799	0,057997765
8	ateşli tartışma	2.236	6,626	0,2585302	0,069386335
9	zengin tarih	4,472	4,095	0,148883754	0,107675112
10	altın çağ	7.071	8.235	0,288001334	0,662424661
11	orta sınıf	18,515	7,55	0,571845052	0,717553074
12	karşıt görüş	2.828	6.483	0,2835857	0,086918327
13	yüksek mahkeme	11,916	6.265	0,18790167	0,721422467

14	ölümsüz aşk	3.606	7.299	0,567434829	0,080460283
15	beyaz yalan	3,873	4,04	0,067259913	0,154253347
MEAN		7.20	6.38	0.3275402	0.359449
ADJ+NOUN	**Turkish**	***t***	**MI**	**$\Delta P_{1\|2}$**	**$\Delta P_{2\|1}$**
Non-congruent					
1	açık fikir	5,099	3.745	0,057311158	0,229227913
2	uzun vade	5,831	6.942	0,047932394	0,807587444
3	sağanak yağmur	5,744	10.811	0,882587315	0,29039062
4	yoğun duman	4,123	6,519	0,099682895	0,422777332
5	kabarık saç	1.414	8.174	0,289435073	0,070472065
6	keskin koku	4.472	8.346	0,334000758	0,408997157
7	takma diş	2.646	8.438	0,40485755	0,157338522
8	koyu kahve	6.557	8.241	0,466882746	0,444305693
9	alkolsüz içki	2.646	10.243	0,747064138	0,126926517
10	itici güç	10.344	9.634	0,898928767	0,3335825
11	yüksek bina	4.472	4.005	0,031559395	0,338225507
12	büyük başarı	15,587	5,17	0,125241355	0,760648479
13	sert düşüş	3	6,166	0,077465551	0,285530851
14	köklü değişiklik	6.164	8.415	0,560222668	0,348399513
15	tam yetki	4.472	3.673	0,030771603	0,298049995
MEAN		5.30	7.38	0.3369296	0.354831

APPENDIX E: Semantic Association Checklist (sample)

- Can you please write down the first **<u>THREE</u>** related words that pop into your head when you see the words below? See the example before you begin.

E.g. Nurse – doctor, hospital, patient, affection, look after etc.

MAKE ________, ________, ________

PAY ________, ________, ________

HEATED ________, ________, ________

COLD ________, ________, ________

APPENDIX F: Collocation Checklist (sample)

- **Anlamını ve kullanımı bildiğiniz eşdizimli kelime gruplarının yanına tik atın. Eğer emin değilseniz lütfen boş bırakın.**

make a mistake	
give permission	
take pleasure	
find solace	
show affection	
take breath	
find a solution	
commit murder	
give priority	
make a discovery	
find a clue	
break heart	
open fire	
win a victory	
pass time	
make a decision	
pay attention	
cast doubt	
go bankrupt	
take a break	
feel the need	
put pressure	
lose weight	
pay a visit	
shed light	
set an example	
grow beard	
have an accident	
place emphasis	
keep a secret	

deep sleep	
cold war	
outside world	
strong evidence	
naked eye	
warm welcome	
bitter end	
heated debate	
rich history	
golden age	
middle class	
opposing view	
high court	
undying love	
white lie	
open mind	
long run	
heavy rain	
thick smoke	
wiry hair	
strong smell	
false tooth	
strong coffee	
soft drink	
driving force	
tall building	
high achievement	
sharp fall	
drastic change	
free rein	

APPENDIX G: Prime word frequencies of the collocate and non-collocate items (Exp. 1)

VERB primes	Non-collocate Prime Frequency	Collocate Prime Frequency
al-/yap-	169	216
git-/ver-	86	140
gör-/al-	119	169
bak-/bul-	38	66
öğren-/göster-	41	47
yap-/al-	216	169
bil-/bul-	42	66
bağır-/işle-	4	4
git-/ver-	86	140
al-/yap-	169	216
bak-/bul-	38	66
sil-/kır-	5	9
tut-/aç-	37	27
tut-/kazan-	37	32
kurtar-/geçir-	24	31
git-/ver-	86	140
uyap-/et-	216	376
kızdır-/uyandır-	1	3
ol-/et-	539	376
gör-/ver-	119	140
sor-/duy-	22	20
et-/yap-	376	216
gör-/ver-	119	140
ol-/et-	539	376
kıoy-/tut-	29	37
et-/ol-	376	539
görüş-/bırak-	18	26
et-/yap-	376	216
ol-/yap-	539	216
götür-/sakla-	13	7
Mean	**149,3**	**140,8666667**

ADJECTIVE primes	Non-collocate Prime Frequency	Collocate Prime Frequency
gizli/ derin	145	167.75
uzak/soğuk	182	128
geç/dış	126	313
şiddetli/kuvvetli	42	42
yapay/çıplak	34	49
mevcut/sıcak	182	155
hoş/acı	112	140
şanslı/ateşli	17	14
sayılı/zengin	130	114
kesin/altın	141	124
ağır/orta	254	256.81
neşeli/karşıt	25	20
güzel/yüksek	594	614
çelimsiz/ölümsüz	5	10
siyah/beyaz	108	208
temel/açık	460	428
açık/uzun	428	675
gururlu/sağanak	5	4
hızlı/yogun	205	153.54
endişeli/kabarık	6	5
parlak/keskin	59	40
sisli/takma	4	10
adil/koyu	36	49
renksiz/alkolsüz	6	2
nazik/itici	15	12
ciddi/yüksek	200	414
doğru/büyük	862	1200
ucuz/sert	55	107.18
kızgın/köklü	20	30
az/tam	613	630
Mean	**169,0333333**	**208,8461538**

APPENDIX H: A full list of the collocations, non-collocations, fillers, and non-words exploited in Experiment 1

	Prime	Target	
Collocation	yapmak	HATA	HATA YAPMAK
Non-coll	almak	HATA	
Filler	dürtmek	PAZI	
Non-word	çarpmak	LATİ	
Collocation	vermek	İZİN	İZİN VERMEK
Non-coll	gitmek	İZİN	
Filler	delmek	EZAN	
Non-word	sevmek	ATEP	
Collocation	almak	KEYIF	KEYİF ALMAK
Non-coll	görmek	KEYIF	
Filler	itmek	TELIF	
Non-word	açmak	ZALÜF	
Collocation	bulmak	HUZUR	HUZUR BULMAK
Non-coll	bakmak	HUZUR	
Filler	kusmak	ZARAR	
Non-word	basmak	GOVİT	
Coll	göstermek	ŞEFKAT	ŞEFKAT GÖSTERMEK
Non-coll	öğrenmek	ŞEFKAT	
Filler	gezdirmek	ZİYNET	
Non-word	gerekmek	CURKOM	
Coll	almak	NEFES	NEFES ALMAK
Non-coll	yapmak	NEFES	
Filler	ezmek	VEKİL	
Non-word	içmek	DAPOŞ	

	Prime	Target	
Coll	bulmak	ÇÖZÜM	ÇÖZÜM BULMAK
Non-coll	bilmek	ÇÖZÜM	
Filler	yermek	DENEK	
Non-word	gülmek	BİTEM	
Coll	işlemek	CİNAYET	CİNAYET İŞLEMEK
Non-coll	bağırmak	CİNAYET	
Filler	terlemek	DİYANET	
Non-word	izlemek	DEKALEP	
Coll	vermek	ÖNCELİK	ÖNCELİK VERMEK
Non-coll	gitmek	ÖNCELİK	
Filler	yırtmak	İNCELEME	
Non-word	vurmak	ARTELİS	
Coll	yapmak	KEŞİF	KEŞİF YAPMAK
Non-coll	almak	KEŞİF	
Filler	satmak	DELİL	
Non-word	yakmak	TAÇIL	
Coll	bulmak	İPUCU	İPUCU BULMAK
Non-coll	bakmak	İPUCU	
Filler	bölmek	TANIK	
Non-word	binmek	ARECE	
Coll	kırmak	KALP	KALP KIRMAK
Non-coll	silmek	KALP	
Filler	duymak	TAŞ	
Non-word	koşmak	TUYT	

	Prime	Target	
Coll	açmak	ATEŞ	ATEŞ AÇMAK
Non-coll	tutmak	ATEŞ	
Filler	ötmek	ŞAHIS	
Non-word	asmak	ÜYÜŞ	
Coll	kazanmak	ZAFER	ZAFER KAZANMAK
Non-coll	tutmak	ZAFER	
Filler	taramak	BEKAR	
Non-word	konuşmak	RİVEK	
Coll	geçirmek	ZAMAN	ZAMAN GEÇİRMEK
Non-coll	kurtarmak	ZAMAN	
Filler	yatırmak	MEKAN	
Non-word	görüşmek	DÜMEY	
Coll	vermek	KARAR	KARAR VERMEK
Non-coll	gitmek	KARAR	
Filler	dalmak	DAMAR	
Non-word	kaçmak	YERİR	
Coll	etmek	DİKKAT	DİKKAT ETMEK
Non-coll	yapmak	DİKKAT	
Filler	uçmak	TAKLİT	
Non-word	inmek	ZATTİM	
Coll	uyandırmak	ŞÜPHE	ŞÜPHE UYANDIRMAK
Non-coll	kızdırmak	ŞÜPHE	
Filler	göndermek	RÜTBE	
Non-word	kurtulmak	CARTİ	

	Prime	Target	
Coll	etmek	İFLAS	İFLAS ETMEK
Non-coll	olmak	İFLAS	
Filler	gömmek	İFFET	
Non-word	kılmak	ATKİS	
Coll	vermek	ARA	ARA VERMEK
Non-coll	görmek	ARA	
Filler	kesmek	KAR	
Non-word	çizmek	ERÜ	
Coll	duymak	İHTİYAÇ	İHTİYAÇ DUYMAK
Non-coll	sormak	İHTİYAÇ	
Filler	örmek	İYİLİK	
Non-word	çekmek	ELMİKAŞ	
Coll	yapmak	BASKI	BASKI YAPMAK
Non-coll	etmek	BASKI	
Filler	yüzmek	TEPSİ	
Non-word	saymak	YELKİ	
Coll	vermek	KİLO	KİLO VERMEK
Non-coll	görmek	KİLO	
Filler	dönmek	VANA	
Non-word	uyumak	VEFİ	
Coll	etmek	ZİYARET	ZİYARET ETMEK
Non-coll	olmak	ZİYARET	
Filler	çalmak	FELAKET	
Non-word	yetmek	TÜNARAÇ	

	Prime	Target	
Coll	tutmak	IŞIK	**IŞIK TUTMAK**
Non-coll	koymak	IŞIK	
Filler	dövmek	ATIK	
Non-word	giymek	AYEK	
Coll	olmak	ÖRNEK	**ÖRNEK OLMAK**
Non-coll	etmek	ÖRNEK	
Filler	dolmak	İBRİK	
Non-word	inmek	ARPES	
Coll	bırakmak	SAKAL	**SAKAL BIRAKMAK**
Non-coll	görüşmek	SAKAL	
Filler	buluşmak	TALAŞ	
Non-word	görünmek	ZİBAF	
Coll	yapmak	KAZA	**KAZA YAPMAK**
Non-coll	etmek	KAZA	
Filler	adamak	TAZI	
Non-word	girmek	GÖZİ	
Coll	yapmak	VURGU	**VURGU YAPMAK**
Non-coll	olmak	VURGU	
Filler	atlamak	YERGİ	
Non-word	düşmek	RUNDA	
Coll	saklamak	SIR	**SIR SAKLAMAK**
Non-coll	götürmek	SIR	
Filler	başlamak	DERT	
Non-word	değişmek	RİM	

	Prime	Target	
Coll	derin	UYKU	**DERİN UYKU**
Non-coll	gizli	UYKU	
Filler	güçlü	SELVİ	
Non-word	mutlu	EYTİ	
Coll	soğuk	SAVAŞ	**SOĞUK SAVAŞ**
Non-coll	uzak	SAVAŞ	
Filler	geniş	NEFRET	
Non-word	çukur	SAGİT	
Coll	dış	DÜNYA	**DIŞ DÜNYA**
Non-coll	geç	DÜNYA	
Filler	zor	BAHÇE	
Non-word	düz	BİNTE	
Coll	kuvvetli	DELİL	**KUVVETLİ DELİL**
Non-coll	şiddetli	DELİL	
Filler	yeterli	AKŞAM	
Non-word	başarılı	YUKER	
Coll	çıplak	GÖZ	**ÇIPLAK GÖZ**
Non-coll	yapay	GÖZ	
Filler	tembel	BEY	
Non-word	tombul	KUN	
Coll	sıcak	KARŞILAMA	**SICAK KARŞILAMA**
Non-coll	mevcut	KARŞILAMA	
Filler	benzer	DOĞRULAMA	
Non-word	sönük	YERTİLEPE	

	Prime	Target	
Coll	acı	SON	**ACI SON**
Non-coll	hoş	SON	
Filler	eski	TEN	
Non-word	dik	REK	
Coll	ateşli	TARTIŞMA	**ATEŞLİ TARTIŞMA**
Non-coll	şanslı	TARTIŞMA	
Filler	baygın	BAKIŞMA	
Non-word	şaşkın	KERTİÇLE	
Coll	zengin	TARİH	**ZENGİN TARİH**
Non-coll	sayılı	TARİH	
Filler	yakın	KELAM	
Non-word	zalim	YAKİR	
Coll	altın	ÇAĞ	**ALTIN ÇAĞ**
Non-coll	kesin	ÇAĞ	
Filler	makul	TAY	
Non-word	süslü	NÖL	
Coll	orta	SINIF	**ORTA SINIF**
Non-coll	ağır	SINIF	
Filler	kaba	ÇEYİZ	
Non-word	yeni	KELON	
Coll	karşıt	GÖRÜŞ	**KARŞIT GÖRÜŞ**
Non-coll	neşeli	GÖRÜŞ	
Filler	gerçek	DALIŞ	
Non-word	berbat	PETÜR	

	Prime	Target	
Coll	yüksek	MAHKEME	**YÜKSEK MAHKEME**
Non-coll	güzel	MAHKEME	
Filler	dazlak	KARAKOL	
Non-word	çağdaş	LOPYEMA	
Coll	ölümsüz	AŞK	**ÖLÜMSÜZ AŞK**
Non-coll	çelimsiz	AŞK	
Filler	buruşuk	TER	
Non-word	fütursuz	İLT	
Coll	beyaz	YALAN	**BEYAZ YALAN**
Non-coll	siyah	YALAN	
Filler	alçak	KEFEN	
Non-word	yeşil	DULİM	
Coll	açık	FİKİR	**AÇIK FİKİR**
Non-coll	temel	FİKİR	
Filler	ılık	ZEHİR	
Non-word	taze	ETİF	
Coll	uzun	VADE	**UZUN VADE**
Non-coll	açık	VADE	
Filler	duru	KALE	
Non-word	kısa	PEGA	
Coll	sağanak	YAĞMUR	**SAĞANAK YAĞMUR**
Non-coll	gururlu	YAĞMUR	
Filler	yumuşak	YANGIN	
Non-word	sağlıklı	LUPGEM	

	Prime	Target	
Coll	yoğun	DUMAN	**YOĞUN DUMAN**
Non-coll	hızlı	DUMAN	
Filler	sefil	KEDER	
Non-word	çabuk	KEYUM	
Coll	kabarık	SAÇ	**KABARIK SAÇ**
Non-coll	endişeli	SAÇ	
Filler	karışık	LEŞ	
Non-word	lezzetli	POS	
Coll	keskin	KOKU	**KESKİN KOKU**
Non-coll	parlak	KOKU	
Filler	sağlam	PERİ	
Non-word	kısık	HETİ	
Coll	takma	DİŞ	**TAKMA DİŞ**
Non-coll	sisli	DİŞ	
Filler	sivri	ÇÖP	
Non-word	bayat	PEF	
Coll	koyu	KAHVE	**KOYU KAHVE**
Non-coll	adil	KAHVE	
Filler	sıkı	PARKE	
Non-word	zarif	PÜRTO	
Coll	alkolsüz	İÇKİ	**ALKOLSÜZ İÇKİ**
Non-coll	renksiz	İÇKİ	
Filler	yuvarlak	İLAÇ	
Non-word	tehlikeli	ERPA	

	Prime	Target	
Coll	itici	GÜÇ	**İTİCİ GÜÇ**
Non-coll	nazik	GÜÇ	
Filler	şirin	KAT	
Non-word	nahoş	HİY	
Coll	yüksek	BİNA	**YÜKSEK BİNA**
Non-coll	ciddi	BİNA	
Filler	bedava	KİRA	
Non-word	kıskanç	LÖNE	
Coll	büyük	BAŞARI	**BÜYÜK BAŞARI**
Non-coll	doğru	ABAŞARI	
Filler	temiz	LAVABO	
Non-word	gülünç	LAÇERU	
Coll	sert	DÜŞÜŞ	**SERT DÜŞÜŞ**
Non-coll	ucuz	DÜŞÜŞ	
Filler	kolay	OĞLAN	
Non-word	özel	BİYTE	
Coll	köklü	DEĞİŞİKLİK	**KÖKLÜ DEĞİŞİKLİK**
Non-coll	kızgın	DEĞİŞİKLİK	
Filler	ıslak	OLUMSUZLUK	
Non-word	çürük	AZIYIKLEP	
Coll	tam	YETKİ	**TAM YETKİ**
Non-coll	az	YETKİ	
Filler	yaş	ÜCRET	
Non-word	tüm	JELPİ	

APPENDIX I: An Adjusted List of English/Turkish and Cross-linguistic Lexical Items

English	L2-L1	Turkish	L1-L2
VERB +NOUN - *Congruent*			
make a mistake	make hata	hata yapmak	yapmak mistake
give permission	give izin	izin vermek	vermek permission
take pleasure	take keyif	keyif almak	almak pleasure
find solace	find huzur	huzur bulmak	bulmak solace
show affection	show şefkat	şefkat göstermek	göstermek affection
take breath	take nefes	nefes almak	almak breath
find a solution	find çözüm	çözüm bulmak	bulmak solution
commit murder	commit cinayet	cinayet işlemek	işlemek murder
give priority	give öncelik	öncelik vermek	vermek priority
make a discovery	make keşif	keşif yapmak	yapmak discovery
find a clue	find ipucu	ipucu bulmak	bulmak clue
break heart	break kalp	kalp kırmak	kırmak heart
open fire	open ateş	ateş açmak	açmak fire
win a victory	win zafer	zafer kazanmak	kazanmak victory
pass time	pass zaman	zaman geçirmek	geçirmek time
English	**L2-L1**	**Turkish**	**L1-L2**
VERB +NOUN - *Non-congruent*			
make a decision	make karar	karar vermek	vermek decision
pay attention	pay dikkat	dikkat etmek	etmek attention
cast doubt	cast şüphe	şüphe uyandırmak	uyandırmak doubt
go bankrupt	go iflas	iflas etmek	etmek bankrupt
take a break	take ara	ara vermek	vermek break
feel the need	feel ihtiyaç	ihtiyaç duymak	duymak need
put pressure	put baskı	baskı yapmak	yapmak pressure
lose weight	lose kilo	kilo vermek	vermek weight
pay a visit	pay ziyaret	ziyaret etmek	etmek visit
shed light	shed ışık	ışık tutmak	tutmak light
set an example	set örnek	örnek olmak	olmak example
grow beard	grow sakal	sakal bırakmak	bırakmak beard
have an accident	have kaza	kaza yapmak	yapmak accident
place emphasis	place vurgu	vurgu yapmak	yapmak emphasis
keep a secret	keep sır	sır saklamak	saklamak secret
English	**L2-L1**	**Turkish**	**L1-L2**
ADJ+NOUN - *Congruent*			
deep sleep	deep uyku	derin uyku	derin sleep
cold war	cold savaş	soğuk savaş	soğuk war
outside world	outside dünya	dış dünya	dış world
strong evidence	strong delil	kuvvetli delil	kuvvetli evidence

naked eye	naked göz	çıplak göz	çıplak eye
warm welcome	warm karşılama	sıcak karşılama	sıcak welcome
bitter end	bitter son	acı son	acı end
heated debate	heated tartışma	ateşli tartışma	ateşli debate
rich history	rich tarih	zengin tarih	zengin history
golden age	golden çağ	altın çağ	altın age
middle class	middle sınıf	orta sınıf	orta class
opposing view	opposing görüş	karşıt görüş	karşıt view
high court	high mahkeme	yüksek mahkeme	yüksek court
undying love	undying aşk	ölümsüz aşk	ölümsüz love
white lie	white yalan	beyaz yalan	beyaz lie
English	**L2-L1**	**Turkish**	**L1-L2**
ADJ+NOUN - *Non-congruent*			
open mind	open fikir	açık fikir	açık mind
long run	long vade	uzun vade	uzun run
heavy rain	heavy yağmur	sağanak yağmur	sağanak rain
thick smoke	thick duman	yoğun duman	yoğun smoke
wiry hair	wiry saç	kabarık saç	kabarık hair
strong smell	strong koku	keskin koku	keskin smell
false tooth	false diş	takma diş	takma tooth
strong coffee	strong kahve	koyu kahve	koyu coffee
soft drink	soft içki	alkolsüz içki	alkolsüz drink
driving force	driving güç	itici güç	itici force
tall building	tall bina	yüksek bina	yüksek building
high achievement	high başarı	büyük başarı	büyük achievement
sharp fall	sharp düşüş	sert düşüş	sert fall
drastic change	drastic değişiklik	köklü değişiklik	köklü change
free rein	free yetki	tam yetki	tam rein

APPENDIX J: Prime word frequencies of the collocate and non-collocate items (Exp. 2&3)

VERB

Congruent Verb Primes	Non-collocate Prime Frequency	Collocate Prime Frequency	**Incongruent Verb Primes**	Non-collocate Prime Frequency	Collocate Prime Frequency
come/make	126654	121785	come/make	126654	121785
live/give	52479	61376	run/pay	21973	21423
want/take	270343	119839	grab/cast	4556	5400
work/find	54397	60166	say/go	223994	166006
stay/show	27642	45840	look/take	138464	119839
see/take	216186	119839	love/feel	66563	87580
feel/find	87580	60166	try/put	56086	62572
handle/commit	2708	2566	stand/lose	21434	13985
call/give	62074	61376	run/pay	21973	21423
look/make	138464	121785	base/shed	953	258
keep/find	54260	60166	cut/set	36228	32064
raise/break	9288	8307	visit/grow	13888	14038
hear/open	32870	31238	get/have	672070	851322
lie/win	10063	11297	drive/place	12734	22571
realize/pass	12972	11497	wait/keep	30316	54260
Mean	77198,67	59816,2	**Mean**	96525,73	106301,7

ADJECTIVE

Congruent Adjective Primes	Non-collocate Prime Frequency	Collocate Prime Frequency	**Incongruent Verb Primes**	Non-collocate Prime Frequency	Collocate Prime Frequency
deep/tough	45355	42015	poor/open	63550	88455
rich/cold	40235	55276	small/long	202336	173695
famous/outside	32107	21660	safe/heavy	43413	45430
foreign/strong	71624	85747	crazy/thick	28489	26479
cheap/naked	15513	13240	arid/wiry	1742	1223
aware/warm	32972	33669	single/strong	80558	85747
strict/bitter	8429	10485	fast/false	16928	16914
hollow/heated	3265	3560	common/strong	74384	85747
wild/rich	35085	40235	fair/soft	36550	33086
eastern/golden	31925	26705	boring/driving	6513	9849
female/middle	36850	54945	thin/tall	27763	27973
touching/opposing	2177	3910	large/high	142812	235364
great/high	241189	235364	narrow/sharp	21284	20415
tiring/undying	713	262	selfish/drastic	3211	2608
black/white	190509	160161	hard/free	100032	111102
Mean	52529,87	52482,27	**Mean**	56637,67	64272,47

APPENDIX K: A Comprehensive List of Cross-linguistic Filler words and Non-word Pairs

non-word	filler	non-word	filler
help lati	wish pazı	çarpmak blusque	dürtmek product
like atep	fill ezan	sevmek spleighths	delmek difference
read zatüf	kill telif	açmak throarth	itmek instance
turn govit	vote zarar	basmak snadd	kusmak safety
close curkom	sing ziynet	gerekmek phroughts	gezdirmek conclusion
care dapos	pull vekil	içmek swulve	ezmek advice
use bitem	gain denek	gülmek screinns	yermek disease
intend dekalep	depend diyanet	izlemek dweest	terlemek complaint
talk antelis	join inceleme	vurmak pheashed	yırtmak audience
call taçil	lock delil	yakmak frauncher	satmak perception
feed arece	tend tanık	binmek zolc	bölmek idea
reply tuyt	avoid taş	koşmak mufth	duymak power
fail üyüş	beat şahıs	aşmak jief	ötmek fact
fly rivek	tie bekar	konuşmak plarpes	taramak concept
rest dümey	deliver mekan	görüşmek yeel	yatırmak area
non-word	**filler**	**non-word**	**filler**
wash yerir	fool damar	kaçmak throothe	dalmak question
sit zattim	row taklit	inmek yaugenths	uçmak indication
rise carti	pick rütbe	kurtulmak blore	göndermek share
do atkis	hit iffet	kılmak dworlent	gömmek influence
seem erü	push kar	çizmek kraut	kesmek state
wear elmikaş	earn iyilik	çekmek leuc	örmek size
lay yelki	fit tepsi	saymak rheagued	yüzmek distance
save vefi	fear vana	uyumak snorge	dönmek access
let tünaraç	fix felaket	yetmek vares	çalmak guide
stop ayek	hang atık	giymek zilth	dövmek range
eat arpes	cry ibrik	inmek frimbold	dolmak fortune
wash zibaf	cook talaş	görünmek lolth	buluşmak sense
turn gözi	hide tazı	girmek ghwaines	adamak interest
occur runda	waste yergi	düşmek phlieves	atlamak research
mark rim	vary dert	değişmek hownth	başlamak source
non-word	**filler**	**non-word**	**filler**
recent eyti	alive selvi	mutlu gnour	güçlü resort
cute sagit	brief nefret	çukur pag	geniş bill
capable binte	careful bahçe	düz broax	zor trash

hungry yuker	edible akşam	başarılı squarnth	yeterli pattern
civil kun	fresh bey	tombul fet	tembel bet
ugly yertilepe	grim doğruluma	sönük scownse	benzer respect
sudden rek	modest ten	dik swu	eski lip
wooden kertiçle	pricey bakışma	şaşkın zardge	baygın relief
nice yakir	new kelam	zalim spreach	yakın lecture
visual nöl	remote tay	süslü joz	makul god
scarce kelon	polite çeyiz	yeni feck	kaba desk
leading petür	disgusting dalış	berbat kunx	gerçek roof
firm lopyema	neat karakol	çağdaş kieff	dazlak mate
serious ilt	trivial ter	fütursuz hule	buruşuk hole
green dulim	yellow kefen	yeşil ips	alçak bid
non-word	**filler**	**non-word**	**filler**
huge etif	wise zehir	taze rooc	ılık anger
dark pega	wavy kale	kısa vix	duru debt
major lupgem	vague yangın	sağlıklı gube	yumuşak sign
short keyum	vast keder	çabuk knarm	sefil cloud
tiny poş	tidy leş	lezzetli glon	karışık trip
primary heti	tender peri	kısık flisk	sağlam space
wrong pef	swift çöp	bayat cwalb	sivri novel
pretty pürto	robust parke	zarif rummth	sıkı garden
broad erpa	pale ilaç	tehlikeli twowl	yuvarlak recipe
tiring hiy	notable kat	nahoş narth	şirin draft
raw löne	mild kira	kıskanç grighcks	bedava charity
solid laçeru	keen lavabo	gülünç thwaughmoth	temiz significance
weird biyte	slight oğlan	özel koun	kolay ruin
ordinary azıyıklep	diligent olumsuzluk	çürük yirthe	ıslak spirit
calm jelpi	chief ücret	tüm terg	yaş harm

APPENDIX L: A full list of the collocations, non-collocations, fillers, and non-words exploited either in L1-L2 or L2-L1 direction in Experiments 2 and 3

	L2-L1		L1-L2		
	Prime	**Target**	**Prime**	**Target**	
Collocation			yapmak	MISTAKE	**MAKE MISTAKE**
Non-coll			almak	MISTAKE	
Filler			dürtmek	PRODUCT	
Non-word			çarpmak	BLUSQUE	
Collocation	give	İZİN			**GIVE PERMISSION**
Non-coll	live	İZİN			
Filler	fill	EZAN			
Non-word	like	ATEP			
Collocation			almak	PLEASURE	**TAKE PLEASURE**
Non-coll			görmek	PLEASURE	
Filler			itmek	INSTANCE	
Non-word			açmak	THROARTH	
Collocation	find	HUZUR			**FIND SOLACE**
Non-coll	work	HUZUR			
Filler	vote	ZARAR			
Non-word	turn	GOVİT			
Coll			göstermek	AFFECTION	**SHOW AFFECTION**
Non-coll			öğrenmek	AFFECTION	
Filler			gezdirmek	CONCLUSION	
Non-word			gerekmek	PHROUGHTS	
Coll	take	NEFES			**TAKE A BREATH**
Non-coll	see	NEFES			
Filler	pull	VEKİL			
Non-word	care	DAPOS			

	L2-L1		L1-L2		
	Prime	**Target**	**Prime**	**Target**	
Coll			bulmak	SOLUTION	**FIND A SOLUTION**
Non-coll			bilmek	SOLUTION	
Filler			yermek	DISEASE	
Non-word			gülmek	SCREINNS	
Coll	commit	CİNAYET			**COMMIT A SUICIDE**
Non-coll	handle	CİNAYET			
Filler	depend	DİYANET			
Non-word	intend	DEKALEP			
Coll			vermek	PRIORITY	**GIVE PRIORITY**
Non-coll			gitmek	PRIORITY	
Filler			yırtmak	AUDIENCE	
Non-word			vurmak	PHEASHED	
Coll	make	KEŞİF			**MAKE A DISCOVERY**
Non-coll	look	KEŞİF			
Filler	lock	DELİL			
Non-word	call	TAÇIL			
Coll			bulmak	CLUE	**FIND A CLUE**
Non-coll			bakmak	CLUE	
Filler			bölmek	IDEA	
Non-word			binmek	ZOLC	
Coll	break	KALP			**BREAK HEART**
Non-coll	raise	KALP			
Filler	avoid	TAŞ			
Non-word	reply	TUYT			

	L2-L1		L1-L2		
	Prime	Target	Prime	Target	
Coll			açmak	FIRE	OPEN FIRE
Non-coll			tutmak	FIRE	
Filler			ötmek	FACT	
Non-word			asmak	JIEF	
Coll	win	ZAFER			WIN A VICTORY
Non-coll	lie	ZAFER			
Filler	tie	BEKAR			
Non-word	fly	RİVEK			
Coll			geçirmek	TIME	PASS TIME
Non-coll			kurtarmak	TIME	
Filler			yatırmak	AREA	
Non-word			görüşmek	YEEL	
Coll	make	KARAR			MAKE A DECISION
Non-coll	come	KARAR			
Filler	fool	DAMAR			
Non-word	wash	YERİR			
Coll			etmek	ATTENTION	PAY ATTENTION
Non-coll			yapmak	ATTENTION	
Filler			uçmak	INDICATION	
Non-word			inmek	YAUGENTHS	
Coll	cast	ŞÜPHE			CAST DOUBT
Non-coll	grab	ŞÜPHE			
Filler	pick	RÜTBE			
Non-word	rise	CARTİ			

	L2-L1		L1-L2		
	Prime	Target	Prime	Target	
Coll			etmek	BANKRUPT	GO BANKRUPT
Non-coll			olmak	BANKRUPT	
Filler			gömmek	INFLUENCE	
Non-word			kılmak	DWORLENT	
Coll	take	ARA			TAKE A BREAK
Non-coll	look	ARA			
Filler	push	KAR			
Non-word	seem	ERÜ			
Coll			duymak	NEED	FEEL THE NEED
Non-coll			sormak	NEED	
Filler			örmek	SIZE	
Non-word			çekmek	LEUC	
Coll	put	BASKI			PUT PRESSURE
Non-coll	try	BASKI			
Filler	fit	TEPSİ			
Non-word	lay	YELKİ			
Coll			vermek	WEIGHT	LOSE WEIGHT
Non-coll			görmek	WEIGHT	
Filler			dönmek	ACCESS	
Non-word			uyumak	SNORGE	
Coll	pay	ZİYARET			PAY A VISIT
Non-coll	run	ZİYARET			
Filler	fix	FELAKET			
Non-word	let	TÜNARAÇ			

	L2-L1		L1-L2		
	Prime	Target	Prime	Target	
Coll			tutmak	LIGHT	**SHED LIGHT**
Non-coll			koymak	LIGHT	
Filler			dövmek	RANGE	
Non-word			giymek	ZILTH	
Coll	set	ÖRNEK			**SET AN EXAMPLE**
Non-coll	cut	ÖRNEK			
Filler	cry	İBRİK			
Non-word	eat	ARPES			
Coll			bırakmak	BEARD	**GROW BEARD**
Non-coll			görüşmek	BEARD	
Filler			buluşmak	SENSE	
Non-word			görünmek	LOLTH	
Coll	have	KAZA			**HAVE AN ACCIDENT**
Non-coll	get	KAZA			
Filler	hide	TAZI			
Non-word	turn	GÖRİ			
Coll			yapmak	EMPHASIS	**PLACE EMPHASIS**
Non-coll			olmak	EMPHASIS	
Filler			atlamak	RESEARCH	
Non-word			düşmek	PHLIEVES	
Coll	keep	SIR			**KEEP A SECRET**
Non-coll	wait	SIR			
Filler	vary	DERT			
Non-word	mark	RİM			

	L2-L1		L1-L2		
	Prime	Target	Prime	Target	
Coll			derin	SLEEP	**DEEP SLEEP**
Non-coll			gizli	SLEEP	
Filler			güçlü	RESORT	
Non-word			mutlu	GNOUR	
Coll	cold	SAVAŞ			**COLD WAR**
Non-coll	rich	SAVAŞ			
Filler	brief	NEFRET			
Non-word	cute	SAGİT			
Coll			dış	WORLD	**OUTSIDE WORLD**
Non-coll			geç	WORLD	
Filler			zor	TRASH	
Non-word			düz	BROAX	
Coll	strong	DELİL			**STRONG EVIDENCE**
Non-coll	foreign	DELİL			
Filler	edible	AKŞAM			
Non-word	hungry	YUKER			
Coll			çıplak	EYE	**NAKED EYE**
Non-coll			yapay	EYE	
Filler			tembel	BET	
Non-word			tombul	FET	
Coll	warm	KARŞILAMA			**WARM WELCOME**
Non-coll	aware	KARŞILAMA			
Filler	grim	DOĞRULAMA			
Non-word	ugly	YERTİLEPE			

	L2-L1		L1-L2		
	Prime	Target	Prime	Target	
Coll			acı	END	BITTER END
Non-coll			hoş	END	
Filler			eski	LIP	
Non-word			dik	SWU	
Coll	heated	TARTIŞMA			HEATED DEBATE
Non-coll	hollow	TARTIŞMA			
Filler	pricey	BAKIŞMA			
Non-word	wooden	KERTİÇLE			
Coll			zengin	HISTORY	RICH HISTORY
Non-coll			sayılı	HISTORY	
Filler			yakın	LECTURE	
Non-word			zalim	SPREACH	
Coll	golden	ÇAĞ			GOLDEN AGE
Non-coll	eastern	ÇAĞ			
Filler	remote	TAY			
Non-word	visual	NÖL			
Coll			orta	CLASS	MIDDLE CLASS
Non-coll			ağır	CLASS	
Filler			kaba	DESK	
Non-word			yeni	FECK	
Coll	opposing	GÖRÜŞ			OPPOSING VIEW
Non-coll	touching	GÖRÜŞ			
Filler	disgusting	DALIŞ			
Non-word	leading	PETÜR			

	L2-L1		L1-L2		
	Prime	Target	Prime	Target	
Coll			yüksek	COURT	HIGH COURT
Non-coll			güzel	COURT	
Filler			dazlak	MATE	
Non-word			çağdaş	KIEFF	
Coll	undying	AŞK			UNDYING LOVE
Non-coll	tiring	AŞK			
Filler	trivial	TER			
Non-word	serious	İLT			
Coll			beyaz	LIE	WHITE LIE
Non-coll			siyah	LIE	
Filler			alçak	BID	
Non-word			yeşil	IPS	
Coll	open	FİKİR			OPEN MIND
Non-coll	poor	FİKİR			
Filler	wise	ZEHİR			
Non-word	huge	ETİF			
Coll			uzun	RUN	LONG RUN
Non-coll			açık	RUN	
Filler			duru	DEBT	
Non-word			kısa	VIX	
Coll	heavy	YAĞMUR			HEAVY RAIN
Non-coll	safe	YAĞMUR			
Filler	vague	YANGIN			
Non-word	major	LUPGEM			

	L2-L1		L1-L2		
	Prime	Target	Prime	Target	
Coll			yoğun	SMOKE	THICK SMOKE
Non-coll			hızlı	SMOKE	
Filler			sefil	CLOUD	
Non-word			çabuk	KNARM	
Coll	wiry	SAÇ			WIRY HAIR
Non-coll	arid	SAÇ			
Filler	tidy	LEŞ			
Non-word	tiny	POS			
Coll			keskin	SMELL	STRONG SMELL
Non-coll			parlak	SMELL	
Filler			sağlam	SPACE	
Non-word			kısık	FLISK	
Coll	false	DİŞ			FALSE TOOTH
Non-coll	fast	DİŞ			
Filler	swift	ÇÖP			
Non-word	wrong	PEF			
Coll			koyu	COFFEE	STRONG COFFEE
Non-coll			adil	COFFEE	
Filler			sıkı	GARDEN	
Non-word			zarif	RUMMTH	
Coll	soft	İÇKİ			SOFT DRINK
Non-coll	fair	İÇKİ			
Filler	pale	İLAÇ			
Non-word	broad	ERPA			

	L2-L1		L1-L2		
	Prime	Target	Prime	Target	
Coll			itici	FORCE	DRIVING FORCE
Non-coll			nazik	FORCE	
Filler			şirin	DRAFT	
Non-word			nahoş	NARTH	
Coll	tall	BİNA			TALL BUILDING
Non-coll	thin	BİNA			
Filler	mild	KİRA			
Non-word	raw	LÖNE			
Coll			büyük	ACHIEVEMENT	HIGH ACHIEVEMENT
Non-coll			doğru	ACHIEVEMENT	
Filler			temiz	SIGNIFICANCE	
Non-word			gülünç	THWAUGHMOTH	
Coll	sharp	DÜŞÜŞ			SHARP FALL
Non-coll	narrow	DÜŞÜŞ			
Filler	slight	OĞLAN			
Non-word	weird	BİYTE			
Coll			köklü	CHANGE	DRASTIC CHANGE
Non-coll			kızgın	CHANGE	
Filler			ıslak	SPIRIT	
Non-word			çürük	YIRTHE	
Coll	free	YETKİ			FREE REIN
Non-coll	hard	YETKİ			
Filler	chief	YETKİ			
Non-word	calm	JELPİ			

APPENDIX M: Web-platform used for remote application

(A screenshot from hakancangir.weebly.com)

Previous Steps

Step 1: Language History Questionnaire

Step 2: Vocabulary Size Test

*If you made this far, it means you have covered those two steps and now I ask for another precious 20' of yours.

FOLLOW THE STEPS BELOW, PLEASE!

!Make sure you are in a quiet and relaxing place with NO DISTRACTORS!

!**Google Chrome** Web Browser is recommended!

Step 3: Digit Span Test

Download the test below onto your computer and run it. Save your score at the end of the test and WRITE IT INTO THE BOX BELOW AND HIT SUBMIT

*It takes less than 3'

!**Windows** operating system is required!

!Please make sure **NO OTHER PROGRAM ON YOUR COMPUTER IS RUNNING** during the test!

Step 4: Experiment

Download the .exe file below and run it. The test will run and send the results automatically!

You will see some words on the screen **either in Turkish or English** and decide whether they are **REAL WORDS** OR **NON-WORDS**. Hit **RIGHT CTRL** for **REAL WORDS** and **LEFT CTRL** for **NON-WORDS**

*It takes 8-10'

CLICK HERE FOR THE ENG-TR EXPERIMENT

Step 5: End of test Questionnaire

After the experiment the questionnaire window opens automatically. If it fails, you can use the link below.

It takes 3'

IF NECESSARY Click here to go to the questionnaire

!If the Digit Span Test in the above link fails to report your score, use the alternative below!

ALTERNATIVE DIGIT SPAN TEST

WRITE YOUR DIGIT SPAN SCORE *

EMAIL *

PARTICIPANT ID AND SURNAME? *

First Last

SUBMIT

APPENDIX N: Priming DMDX Script for the Second and Third Experiments

```
<azk> <cr> <noi 96> <s 260> <id #keyboard><t 2500> <id #mouse> <nfb> <dbc
210210210> <dfs 55> <df Arial> <mnr “+#29”> <mpr “+#157”>
$~3 ma++ mb++ mc++ md++ <mpr +#28>;
 +501 @-2 <x .1> "Type name and hit ENTER" ,
 <px .1> ~c, "|", ~d <prose a,b,c,d> <mwb +#28,502 bu,-501> ;
 502 <emit name:~a~b:> "Done";$
$00 <ln -1> “This is a lexical decision task”,
   <ln 0> “Right Ctrl for REAL WORD”,
   <ln 1>  “Left Ctrl for NON-WORD”,
   <ln 2> “Press SPACE for a trial”;$
$+225 <ms% 500> “*” / <ms% 200> “#########” / <ms% 100> “do” / <ms% 50>/ * “ÖDEV” ;$
$+225 <ms% 500> “*” / <ms% 200> “#########” / <ms% 100> “go” / <ms% 50>/ * “KİTAP” ;$
$+225 <ms% 500> “*” / <ms% 200> “#########” / <ms% 100> “do” / <ms% 50>/ * “YİTAZ” ;$
$+225 <ms% 500> “*” / <ms% 200> “#########” / <ms% 100> “yapmak” / <ms% 50>/ * “HOMEWORK” ;$
$+225 <ms% 500> “*” / <ms% 200> “#########” / <ms% 100> “etmek” / <ms% 50>/ * “COMPUTER” ;$
$+225 <ms% 500> “*” / <ms% 200> “#########” / <ms% 100> “do” / <ms% 50>/ * “BOTTLE” ;$

$00 <ln -1> “Press SPACE for”,
    <ln 0> “the Real Test”,
    <ln 1> “Respond as fast as”,
    <ln 2> “you can, please!”;$
+1 <ms% 500> “*” / <ms% 200> “#########” / <ms% 100> “yapmak” / <ms% 50>/ * “MISTAKE” ;
+2 <ms% 500> “*” / <ms% 200> “#########” / <ms% 100> “almak” / <ms% 50>/ * “MISTAKE” ;
+3 <ms% 500> “*” / <ms% 200> “#########” / <ms% 100> “dürtmek” / <ms% 50>/ * “PRODUCT” ;
-250 <ms% 500> “*” / <ms% 200> “#########” / <ms% 100> “çarpmak” / <ms% 50>/ * “BLUSQUE” ;
+4 <ms% 500> “*” / <ms% 200> “#########” / <ms% 100> “give” / <ms% 50>/ * “İZİN” ;
+5 <ms% 500> “*” / <ms% 200> “#########” / <ms% 100> “live” / <ms% 50>/ * “İZİN” ;
+6 <ms% 500> “*” / <ms% 200> “#########” / <ms% 100> “fill” / <ms% 50>/ * “EZAN” ;
-251 <ms% 500> “*” / <ms% 200> “#########” / <ms% 100> “like” / <ms% 50>/ * “ATEP” ;
+7 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “almak” / <ms% 50>/ * “PLEASURE” ;
+8 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “görmek” / <ms% 50>/ * “PLEASURE” ;
+9 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “itmek” / <ms% 50>/ * “INSTANCE” ;
-252 <ms% 500> “*” / <ms% 200> “#########” / <ms% 100> “açmak” / <ms% 50>/ * “THROARTH” ;
+10 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “find” / <ms% 50>/ * “HUZUR” ;
+11 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “work” / <ms% 50>/ * “HUZUR” ;
+12 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “vote” / <ms% 50>/ * “ZARAR” ;
-253 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “turn” / <ms% 50>/ * “GOVİT” ;
+13 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “göstermek” / <ms% 50>/ * “AFFECTION” ;
+14 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “öğrenmek” / <ms% 50>/ * “AFFECTION” ;
+15 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “gezdirmek” / <ms% 50>/ * “CONCLUSION” ;
-254 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “gerekmek” / <ms% 50>/ * “PHROUGHTS” ;
+16 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “take” / <ms% 50>/ * “NEFES” ;
+17 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “see” / <ms% 50>/ * “NEFES” ;
+18 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “pull” / <ms% 50>/ * “VEKİL” ;
-255 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “care” / <ms% 50>/ * “DAPOS” ;
+19 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “bulmak” / <ms% 50>/ * “SOLUTION” ;
+20 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “bilmek” / <ms% 50>/ * “SOLUTION” ;
+21 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “yermek” / <ms% 50>/ * “DISEASE” ;
-256 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “gülmek” / <ms% 50>/ * “SCREINNS” ;
+22 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “commit” / <ms% 50>/ * “CİNAYET” ;
+23 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “handle” / <ms% 50>/ * “CİNAYET” ;
+24 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “depend” / <ms% 50>/ * “DİYANET” ;
```

```
-257 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “intend” / <ms% 50>/ * “DEKALEP” ;
+25 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “vermek” / <ms% 50>/ * “PRIORITY” ;
+26 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “gitmek” / <ms% 50>/ * “PRIORITY” ;
+27 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “yırtmak” / <ms% 50>/ * “AUDIENCE” ;
-258 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “vurmak” / <ms% 50>/ * “PHEASHED” ;
+28 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “make” / <ms% 50>/ * “KEŞİF” ;
+29 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “look” / <ms% 50>/ * “KEŞİF” ;
+30 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “lock” / <ms% 50>/ * “DELİL” ;
-259 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “call” / <ms% 50>/ * “TAÇIL” ;
+31 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “bulmak” / <ms% 50>/ * “CLUE” ;
+32 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “bakmak” / <ms% 50>/ * “CLUE” ;
+33 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “bölmek” / <ms% 50>/ * “IDEA” ;
-260 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “binmek” / <ms% 50>/ * “ZOLC” ;
+34 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “break” / <ms% 50>/ * “KALP” ;
+35 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “raise” / <ms% 50>/ * “KALP” ;
+36 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “avoid” / <ms% 50>/ * “TAŞ” ;
-261 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “reply” / <ms% 50>/ * “TUYT” ;
+37 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “açmak” / <ms% 50>/ * “FIRE” ;
+38 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “tutmak” / <ms% 50>/ * “FIRE” ;
+39 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “ötmek” / <ms% 50>/ * “FACT” ;
-262 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “asmak” / <ms% 50>/ * “JIEF” ;
+40 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “win” / <ms% 50>/ * “ZAFER” ;
+41 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “lie” / <ms% 50>/ * “ZAFER” ;
+42 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “tie” / <ms% 50>/ * “BEKAR” ;
-263 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “fly” / <ms% 50>/ * “RİVEK” ;
+43 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “geçirmek” / <ms% 50>/ * “TIME” ;
+44 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “kurtarmak” / <ms% 50>/ * “TIME” ;
+45 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “yatırmak” / <ms% 50>/ * “AREA” ;
-264 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “görüşmek” / <ms% 50>/ * “YEEL” ;

$0<ln 0> “Take a break….”,
  <ln 1>  “Press SPACE when ready”; $
+46 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “make” / <ms% 50>/ * “KARAR” ;
+47 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “come” / <ms% 50>/ * “KARAR” ;
+48 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “fool” / <ms% 50>/ * “DAMAR” ;
-265 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “wash” / <ms% 50>/ * “YERİR” ;
+49 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “etmek” / <ms% 50>/ * “ATTENTION” ;
+50 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “yapmak” / <ms% 50>/ * “ATTENTION” ;
+51 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “uçmak” / <ms% 50>/ * “INDICATION” ;
-266 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “inmek” / <ms% 50>/ * “YAUGENTHS” ;
+52 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “cast” / <ms% 50>/ * “ŞÜPHE” ;
+53 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “grab” / <ms% 50>/ * “ŞÜPHE” ;
+54 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “pick” / <ms% 50>/ * “RÜTBE” ;
-267 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “rise” / <ms% 50>/ * “CARTİ” ;
+55 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “etmek” / <ms% 50>/ * “BANKRUPT” ;
+56 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “olmak” / <ms% 50>/ * “BANKRUPT” ;
+57 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “gömmek” / <ms% 50>/ * “INFLUENCE” ;
-268 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “kılmak” / <ms% 50>/ * “DWORLENT” ;
+58 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “take” / <ms% 50>/ * “ARA” ;
+59 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “look” / <ms% 50>/ * “ARA” ;
+60 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “push” / <ms% 50>/ * “KAR” ;
-269 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “seem” / <ms% 50>/ * “ERÜ” ;
+61 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “duymak” / <ms% 50>/ * “NEED” ;
+62 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “sormak” / <ms% 50>/ * “NEED” ;
+63 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “örmek” / <ms% 50>/ * “SIZE” ;
-270 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “çekmek” / <ms% 50>/ * “LEUC” ;
```

```
+64 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “put” / <ms% 50>/ * “BASKI” ;
+65 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “try” / <ms% 50>/ * “BASKI” ;
+66 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “fit” / <ms% 50>/ * “TEPSİ” ;
-271 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “lay” / <ms% 50>/ * “YELKİ” ;
+67 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “vermek” / <ms% 50>/ * “WEIGHT” ;
+68 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “görmek” / <ms% 50>/ * “WEIGHT” ;
+69 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “dönmek” / <ms% 50>/ * “ACCESS” ;
-272 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “uyumak” / <ms% 50>/ * “SNORGE” ;
+70 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “pay” / <ms% 50>/ * “ZİYARET” ;
+71 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “run” / <ms% 50>/ * “ZİYARET” ;
+72 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “fix” / <ms% 50>/ * “FELAKET” ;
-273 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “let” / <ms% 50>/ * “TÜNARAÇ” ;
+73 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “tutmak” / <ms% 50>/ * “LIGHT” ;
+74 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “koymak” / <ms% 50>/ * “LIGHT” ;
+75 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “dövmek” / <ms% 50>/ * “RANGE” ;
-274 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “giymek” / <ms% 50>/ * “ZILTH” ;
+76 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “set” / <ms% 50>/ * “ÖRNEK” ;
+77 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “cut” / <ms% 50>/ * “ÖRNEK” ;
+78 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “cry” / <ms% 50>/ * “İBRİK” ;
-275 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “eat” / <ms% 50>/ * “ARPES” ;
+79 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “bırakmak” / <ms% 50>/ * “BEARD” ;
+80 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “görüşmek” / <ms% 50>/ * “BEARD” ;
+81 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “buluşmak” / <ms% 50>/ * “SENSE” ;
-276 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “görünmek” / <ms% 50>/ * “LOLTH” ;
+82 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “have” / <ms% 50>/ * “KAZA” ;
+83 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “get” / <ms% 50>/ * “KAZA” ;
+84 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “hide” / <ms% 50>/ * “TAZI” ;
-277 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “turn” / <ms% 50>/ * “GÖRİ” ;
+85 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “yapmak” / <ms% 50>/ * “EMPHASIS” ;
+86 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “olmak” / <ms% 50>/ * “EMPHASIS” ;
+87 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “atlamak” / <ms% 50>/ * “RESEARCH” ;
-278 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “düşmek” / <ms% 50>/ * “PHLIEVES” ;
+88 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “keep” / <ms% 50>/ * “SIR” ;
+89 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “wait” / <ms% 50>/ * “SIR” ;
+90 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “vary” / <ms% 50>/ * “DERT” ;
-279 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “mark” / <ms% 50>/ * “RİM” ;

$0<ln 0> “Take a break….”,
  <ln 1>  “Press SPACE when ready”; $
+91 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “derin” / <ms% 50>/ * “SLEEP” ;
+92 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “gizli” / <ms% 50>/ * “SLEEP” ;
+93 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “güçlü” / <ms% 50>/ * “RESORT” ;
-280 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “mutlu” / <ms% 50>/ * “GNOUR” ;
+94 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “cold” / <ms% 50>/ * “SAVAŞ” ;
+95 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “rich” / <ms% 50>/ * “SAVAŞ” ;
+96 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “brief” / <ms% 50>/ * “NEFRET” ;
-281 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “cute” / <ms% 50>/ * “SAGİT” ;
+97 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “dış” / <ms% 50>/ * “WORLD” ;
+98 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “geç” / <ms% 50>/ * “WORLD” ;
+99 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “zor” / <ms% 50>/ * “TRASH” ;
-282 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “düz” / <ms% 50>/ * “BROAX” ;
+100 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “strong” / <ms% 50>/ * “DELİL” ;
+101 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “foreign” / <ms% 50>/ * “DELİL” ;
+102 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “edible” / <ms% 50>/ * “AKŞAM” ;
-283 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “hungry” / <ms% 50>/ * “YUKER” ;
+103 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “çıplak” / <ms% 50>/ * “EYE” ;
```

```
+104 <ms% 500> “*” / <ms% 250> “##########” / <ms% 100> “yapay” / <ms% 50>/ * “EYE” ;
+105 <ms% 500> “*” / <ms% 250> “##########” / <ms% 100> “tembel” / <ms% 50>/ * “BET” ;
-284 <ms% 500> “*” / <ms% 250> “##########” / <ms% 100> “tombul” / <ms% 50>/ * “FET” ;
+106 <ms% 500> “*” / <ms% 250> “##########” / <ms% 100> “warm” / <ms% 50>/ * “KARŞILAMA” ;
+107 <ms% 500> “*” / <ms% 250> “##########” / <ms% 100> “aware” / <ms% 50>/ * “KARŞILAMA” ;
+108 <ms% 500> “*” / <ms% 250> “##########” / <ms% 100> “grim” / <ms% 50>/ * “DOĞRULAMA” ;
-285 <ms% 500> “*” / <ms% 250> “##########” / <ms% 100> “ugly” / <ms% 50>/ * “YERTİLEPE” ;
+109 <ms% 500> “*” / <ms% 250> “##########” / <ms% 100> “acı” / <ms% 50>/ * “END” ;
+110 <ms% 500> “*” / <ms% 250> “##########” / <ms% 100> “hoş” / <ms% 50>/ * “END” ;
+111 <ms% 500> “*” / <ms% 250> “##########” / <ms% 100> “eski” / <ms% 50>/ * “LIP” ;
-286 <ms% 500> “*” / <ms% 250> “##########” / <ms% 100> “dik” / <ms% 50>/ * “SWU” ;
+112 <ms% 500> “*” / <ms% 250> “##########” / <ms% 100> “heated” / <ms% 50>/ * “TARTIŞMA” ;
+113 <ms% 500> “*” / <ms% 250> “##########” / <ms% 100> “hollow” / <ms% 50>/ * “TARTIŞMA” ;
+114 <ms% 500> “*” / <ms% 250> “##########” / <ms% 100> “pricey” / <ms% 50>/ * “BAKIŞMA” ;
-287 <ms% 500> “*” / <ms% 250> “##########” / <ms% 100> “wooden” / <ms% 50>/ * “KERTİÇLE” ;
+115 <ms% 500> “*” / <ms% 250> “##########” / <ms% 100> “zengin” / <ms% 50>/ * “HISTORY” ;
+116 <ms% 500> “*” / <ms% 250> “##########” / <ms% 100> “sayılı” / <ms% 50>/ * “HISTORY” ;
+117 <ms% 500> “*” / <ms% 250> “##########” / <ms% 100> “yakın” / <ms% 50>/ * “LECTURE” ;
-288 <ms% 500> “*” / <ms% 250> “##########” / <ms% 100> “zalim” / <ms% 50>/ * “SPREACH” ;
+118 <ms% 500> “*” / <ms% 250> “##########” / <ms% 100> “golden” / <ms% 50>/ * “ÇAĞ” ;
+119 <ms% 500> “*” / <ms% 250> “##########” / <ms% 100> “eastern” / <ms% 50>/ * “ÇAĞ” ;
+120 <ms% 500> “*” / <ms% 250> “##########” / <ms% 100> “remote” / <ms% 50>/ * “TAY” ;
-289 <ms% 500> “*” / <ms% 250> “##########” / <ms% 100> “visual” / <ms% 50>/ * “NÖL”;
+121 <ms% 500> “*” / <ms% 250> “##########” / <ms% 100> “orta” / <ms% 50>/ * “CLASS” ;
+122 <ms% 500> “*” / <ms% 250> “##########” / <ms% 100> “ağır” / <ms% 50>/ * “CLASS” ;
+123 <ms% 500> “*” / <ms% 250> “##########” / <ms% 100> “kaba” / <ms% 50>/ * “DESK” ;
-290 <ms% 500> “*” / <ms% 250> “##########” / <ms% 100> “yeni” / <ms% 50>/ * “FECK” ;
+124 <ms% 500> “*” / <ms% 250> “##########” / <ms% 100> “opposing” / <ms% 50>/ * “GÖRÜŞ” ;
+125 <ms% 500> “*” / <ms% 250> “##########” / <ms% 100> “touching” / <ms% 50>/ * “GÖRÜŞ” ;
+126 <ms% 500> “*” / <ms% 250> “##########” / <ms% 100> “disgusting” / <ms% 50>/ * “DALIŞ” ;
-291 <ms% 500> “*” / <ms% 250> “##########” / <ms% 100> “leading” / <ms% 50>/ * “PETÜR” ;
+127 <ms% 500> “*” / <ms% 250> “##########” / <ms% 100> “yüksek” / <ms% 50>/ * “COURT” ;
+128 <ms% 500> “*” / <ms% 250> “##########” / <ms% 100> “güzel” / <ms% 50>/ * “COURT” ;
+129 <ms% 500> “*” / <ms% 250> “##########” / <ms% 100> “dazlak” / <ms% 50>/ * “MATE” ;
-292 <ms% 500> “*” / <ms% 250> “##########” / <ms% 100> “çağdaş” / <ms% 50>/ * “KIEFF” ;
+130 <ms% 500> “*” / <ms% 250> “##########” / <ms% 100> “undying” / <ms% 50>/ * “AŞK” ;
+131 <ms% 500> “*” / <ms% 250> “##########” / <ms% 100> “tiring” / <ms% 50>/ * “AŞK” ;
+132 <ms% 500> “*” / <ms% 250> “##########” / <ms% 100> “trivial” / <ms% 50>/ * “TER” ;
-293 <ms% 500> “*” / <ms% 250> “##########” / <ms% 100> “serious” / <ms% 50>/ * “İLT” ;
+133 <ms% 500> “*” / <ms% 250> “##########” / <ms% 100> “beyaz” / <ms% 50>/ * “LIE” ;
+134 <ms% 500> “*” / <ms% 250> “##########” / <ms% 100> “siyah” / <ms% 50>/ * “LIE” ;
+135 <ms% 500> “*” / <ms% 250> “##########” / <ms% 100> “alçak” / <ms% 50>/ * “BID” ;
-294 <ms% 500> “*” / <ms% 250> “##########” / <ms% 100> “yeşil” / <ms% 50>/ * “IPS” ;

$0<ln 0> “Take a break….”,
  <ln 1>  “Press SPACE when ready”; $
+136 <ms% 500> “*” / <ms% 250> “##########” / <ms% 100> “open” / <ms% 50>/ * “FİKİR” ;
+137 <ms% 500> “*” / <ms% 250> “##########” / <ms% 100> “poor” / <ms% 50>/ * “FİKİR” ;
+138 <ms% 500> “*” / <ms% 250> “##########” / <ms% 100> “wise” / <ms% 50>/ * “ZEHİR” ;
-295 <ms% 500> “*” / <ms% 250> “##########” / <ms% 100> “huge” / <ms% 50>/ * “ETİF” ;
+139 <ms% 500> “*” / <ms% 250> “##########” / <ms% 100> “uzun” / <ms% 50>/ * “RUN” ;
+140 <ms% 500> “*” / <ms% 250> “##########” / <ms% 100> “açık” / <ms% 50>/ * “RUN” ;
+141 <ms% 500> “*” / <ms% 250> “##########” / <ms% 100> “duru” / <ms% 50>/ * “DEBT” ;
-296 <ms% 500> “*” / <ms% 250> “##########” / <ms% 100> “kısa” / <ms% 50>/ * “VIX” ;
+142 <ms% 500> “*” / <ms% 250> “##########” / <ms% 100> “heavy” / <ms% 50>/ * “YAĞMUR” ;
+143 <ms% 500> “*” / <ms% 250> “##########” / <ms% 100> “safe” / <ms% 50>/ * “YAĞMUR” ;
```

+144 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “vague” / <ms% 50>/ * “YANGIN” ;
-297 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “major” / <ms% 50>/ * “LUPGEM” ;
+145 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “yoğun” / <ms% 50>/ * “SMOKE” ;
+146 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “hızlı” / <ms% 50>/ * “SMOKE” ;
+147 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “sefil” / <ms% 50>/ * “CLOUD” ;
-298 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “çabuk” / <ms% 50>/ * “KNARM” ;
+148 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “wiry” / <ms% 50>/ * “SAÇ” ;
+149 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “arid” / <ms% 50>/ * “SAÇ” ;
+150 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “tidy” / <ms% 50>/ * “LEŞ” ;
-299 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “tiny” / <ms% 50>/ * “POS” ;
+151 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “keskin” / <ms% 50>/ * “SMELL” ;
+152 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “parlak” / <ms% 50>/ * “SMELL” ;
+153 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “sağlam” / <ms% 50>/ * “SPACE” ;
-300 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “kısık” / <ms% 50>/ * “FLISK” ;
+154 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “false” / <ms% 50>/ * “DİŞ” ;
+155 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “fast” / <ms% 50>/ * “DİŞ” ;
+156 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “swift” / <ms% 50>/ * “ÇÖP” ;
-301 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “wrong” / <ms% 50>/ * “PEF” ;
+157 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “koyu” / <ms% 50>/ * “COFFEE” ;
+158 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “adil” / <ms% 50>/ * “COFFEE” ;
+159 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “sıkı” / <ms% 50>/ * “GARDEN” ;
-302 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “zarif” / <ms% 50>/ * “RUMMTH” ;
+160 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “soft” / <ms% 50>/ * “İÇKİ” ;
+161 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “fair” / <ms% 50>/ * “İÇKİ” ;
+162 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “pale” / <ms% 50>/ * “İLAÇ” ;
-303 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “broad” / <ms% 50>/ * “ERPA” ;
+163 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “itici” / <ms% 50>/ * “FORCE” ;
+164 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “nazik” / <ms% 50>/ * “FORCE” ;
+165 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “şirin” / <ms% 50>/ * “DRAFT” ;
-304 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “nahoş” / <ms% 50>/ * “NARTH” ;
+166 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “tall” / <ms% 50>/ * “BİNA” ;
+167 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “thin” / <ms% 50>/ * “BİNA” ;
+168 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “mild” / <ms% 50>/ * “KİRA” ;
-305 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “raw” / <ms% 50>/ * “LÖNE” ;
+169 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “büyük” / <ms% 50>/ * “ACHIEVEMENT” ;
+170 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “doğru” / <ms% 50>/ * “ACHIEVEMENT” ;
+171 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “temiz” / <ms% 50>/ * “SIGNIFICANCE” ;
-306 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “gülünç” / <ms% 50>/ * “THWAUGHMOTH” ;
+172 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “sharp” / <ms% 50>/ * “DÜŞÜŞ” ;
+173 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “narrow” / <ms% 50>/ * “DÜŞÜŞ” ;
+174 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “slight” / <ms% 50>/ * “OĞLAN” ;
-307 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “weird” / <ms% 50>/ * “BİYTE” ;
+175 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “köklü” / <ms% 50>/ * “CHANGE” ;
+176 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “kızgın” / <ms% 50>/ * “CHANGE” ;
+177 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “ıslak” / <ms% 50>/ * “SPIRIT” ;
-308 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “çürük” / <ms% 50>/ * “YIRTHE” ;
+178 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “free” / <ms% 50>/ * “YETKİ” ;
+179 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “hard” / <ms% 50>/ * “YETKİ” ;
+180 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “chief” / <ms% 50>/ * “ÜCRET” ;
-309 <ms% 500> “*” / <ms% 250> “#########” / <ms% 100> “calm” / <ms% 50>/ * “JELPİ” ;
+310 <ms% 500> “*” / <ms% 250> “########” / <ms% 100> “perişan” / <ms% 50>/ * “EXCUSE” ;
+311 <ms% 500> “*” / <ms% 250> “########” / <ms% 100> “uslu” / <ms% 50>/ * “HOPE” ;
+312 <ms% 500> “*” / <ms% 250> “########” / <ms% 100> “karanlık” / <ms% 50>/ * “MOVE” ;
+313 <ms% 500> “*” / <ms% 250> “########” / <ms% 100> “local” / <ms% 50>/ * “CEVAP” ;
+314 <ms% 500> “*” / <ms% 250> “########” / <ms% 100> “crowded” / <ms% 50>/ * “YATIRIM” ;

+315 <ms% 500> “*” / <ms% 250> “########” / <ms% 100> “demek” / <ms% 50>/ * “PAGE” ;
+316 <ms% 500> “*” / <ms% 250> “########” / <ms% 100> “söylemek” / <ms% 50>/ * “WEALTH” ;
+317 <ms% 500> “*” / <ms% 250> “########” / <ms% 100> “seek” / <ms% 50>/ * “DENGE” ;
+318 <ms% 500> “*” / <ms% 250> “########” / <ms% 100> “bring” / <ms% 50>/ * “TUTUM” ;
+319 <ms% 500> “*” / <ms% 250> “########” / <ms% 100> “think” / <ms% 50>/ * “ÜMİT” ;
-320 <ms% 500> “*” / <ms% 250> “########” / <ms% 100> “busy” / <ms% 50>/ * “SINAÇ” ;
-321 <ms% 500> “*” / <ms% 250> “########” / <ms% 100> “plenty” / <ms% 50>/ * “BİYAKET” ;
-322 <ms% 500> “*” / <ms% 250> “########” / <ms% 100> “honest” / <ms% 50>/ * “LAZNEK” ;
-323 <ms% 500> “*” / <ms% 250> “########” / <ms% 100> “ilginç” / <ms% 50>/ * “GLASK” ;
-324 <ms% 500> “*” / <ms% 250> “########” / <ms% 100> “rahat” / <ms% 50>/ * “PHLONCE” ;
-325 <ms% 500> “*” / <ms% 250> “########” / <ms% 100> “leave” / <ms% 50>/ * “HERKİ” ;
-326 <ms% 500> “*” / <ms% 250> “########” / <ms% 100> “arrive” / <ms% 50>/ * “SELAN” ;
-327 <ms% 500> “*” / <ms% 250> “########” / <ms% 100> “kalmak” / <ms% 50>/ * “CLUV” ;
-328 <ms% 500> “*” / <ms% 250> “########” / <ms% 100> “yazmak” / <ms% 50>/ * “VONG” ;
-329 <ms% 500> “*” / <ms% 250> “########” / <ms% 100> “yaratmak” / <ms% 50>/ * “PONZE” ;

$0 ”Thanks for your patience”;$

APPENDIX O: Priming DMDX Script for the First Experiment

```
<azk> <cr> <noi 96> <s 260> <id #keyboard><t 2500> <id #mouse> <nfb> <dbc
210210210> <dfs 55> <df Arial> <mnr “+#29”> <mpr “+#157”>
$~3 ma++ mb++ mc++ md++ <mpr +#28>;
 +501 @-2 <x .1> "Type name and hit ENTER" ,
 <px .1> ~c, "|", ~d <prose a,b,c,d> <mwb +#28,502 bu,-501> ;
 502 <emit name:~a~b:> "Done";$
$00 <ln -1> “This is a lexical decision task”,
   <ln 0> “Right Ctrl for REAL WORD”,
   <ln 1>  “Left Ctrl for NON-WORD”,
   <ln 2> “Press SPACE for a trial”;$
$+225 <ms% 500> “*” / <ms% 200> “########” / <ms% 100> “yapmak” / <ms% 50>/ * “ÖDEV” ;$
$+225 <ms% 500> “*” / <ms% 200> “########” / <ms% 100> “gitmek” / <ms% 50>/ * “KİTAP” ;$
$+225 <ms% 500> “*” / <ms% 200> “########” / <ms% 100> “sevmek” / <ms% 50>/ * “YİTAZ” ;$
$+225 <ms% 500> “*” / <ms% 200> “########” / <ms% 100> “yapmak” / <ms% 50>/ * “KALEM” ;$
$+225 <ms% 500> “*” / <ms% 200> “########” / <ms% 100> “etmek” / <ms% 50>/ * “SEVGİ” ;$
$+225 <ms% 500> “*” / <ms% 200> “########” / <ms% 100> “silmek” / <ms% 50>/ * “LETUZ” ;$

$00 <ln -1> “Press SPACE for”,
    <ln 0> “the Real Test”,
    <ln 1> “Respond as fast as”,
    <ln 2> “you can, please!”;$
+1 <ms% 500> “*” / <ms% 200> “########” / <ms% 100> “yapmak” / <ms% 50>/ * “HATA” ;
+2 <ms% 500> “*” / <ms% 200> “########” / <ms% 100> “almak” / <ms% 50>/ * “HATA” ;
+3 <ms% 500> “*” / <ms% 200> “########” / <ms% 100> “dürtmek” / <ms% 50>/ * “PAZI” ;
-250 <ms% 500> “*” / <ms% 200> “########” / <ms% 100> “çarpmak” / <ms% 50>/ * “LATİ” ;
+4 <ms% 500> “*” / <ms% 200> “########” / <ms% 100> “vermek” / <ms% 50>/ * “İZİN” ;
+5 <ms% 500> “*” / <ms% 200> “########” / <ms% 100> “gitmek” / <ms% 50>/ * “İZİN” ;
+6 <ms% 500> “*” / <ms% 200> “########” / <ms% 100> “delmek” / <ms% 50>/ * “EZAN” ;
-251 <ms% 500> “*” / <ms% 200> “########” / <ms% 100> “sevmek” / <ms% 50>/ * “ATEP” ;
+7 <ms% 500> “*” / <ms% 250> “########” / <ms% 100> “almak” / <ms% 50>/ * “KEYİF” ;
+8 <ms% 500> “*” / <ms% 250> “########” / <ms% 100> “görmek” / <ms% 50>/ * “KEYİF” ;
+9 <ms% 500> “*” / <ms% 250> “########” / <ms% 100> “itmek” / <ms% 50>/ * “TELİF” ;
-252 <ms% 500> “*” / <ms% 200> “########” / <ms% 100> “açmak” / <ms% 50>/ * “ZATÜF” ;
+10 <ms% 500> “*” / <ms% 250> “########” / <ms% 100> “bulmak” / <ms% 50>/ * “HUZUR” ;
+11 <ms% 500> “*” / <ms% 250> “########” / <ms% 100> “bakmak” / <ms% 50>/ * “HUZUR” ;
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-329 <ms% 500> “*” / <ms% 250> “########” / <ms% 100> “yaratmak” / <ms% 50>/ * “POROJ” ;

$0 ”Thanks for your patience”;$

APPENDIX P: End-of-Test Questionnaire

1. **E-mail adresiniz?** *

2. **Cinsiyet** *
Yalnızca bir şıkkı işaretleyin.
   - Erkek
   - Kadın
   - Belirtmemeyi tercih ediyorum

3. **Ad ve Soyadınız** *

4. **Yaşınız**

Sınav Sonu Anketi

Test sonuçlarının güvenirliğini arttırmak için aşağıdaki soruları cevaplamanız rica olunur!

5. **Ciddi bir görme bozukluğunuz var mı?** *
*Test sırasında ekranda görünen bazı kelimeleri okumakta zorlandınız mı?
Yalnızca bir şıkkı işaretleyin.
   - EVET
   - HAYIR

6. **Daha önce hiç "kısa süreli hafızanızla" ilgili ciddi bir sorun yaşadınız mı?** *
*herhangi bir kaza sonucu oluşmuş kalıcı ya da geçici kısa süreli hafıza kaybı vb.
Yalnızca bir şıkkı işaretleyin.
   - EVET
   - HAYIR

7. **Baskın eliniz hangisi?** *
Yalnızca bir şıkkı işaretleyin.
   - SAĞ
   - SOL
   - HER İKİ ELİMİ DE AYNI BASKINLIKTA/SIKLIKTA KULLANIRIM

8. **Test sırasında ekranda ANLIK görünen (YANIP SÖNEN) kelimeleri farkedebildiniz mi?** *
*Ekranda uzun süre duran ve cevap vermeniz istenen kelimeler KASTEDİLMEMEKTEDIR!
Yalnızca bir şıkkı işaretleyin.

- Hepsini okuyabildim/farkedebildim
- Çoğunu okuyabildim/farkedebildim
- Birkaçını okuyabildim/farkedebildim
- Hiçbirini okuyamadim/farkedemedim

9. **Bu kelimelerden aklınızda kalanları aşağıya not edebilir misiniz?**

APPENDIX Q: Prime Word Checklist – sample (Önceleyen Kelime Kontrol Testi)

- Below are the words, which were flashed to you for 100 ms during the experiment before each primed word as well as some random words. It was assumed by the researcher that you processed them subconsciously. State if you saw them long enough for you to comprehend or you didn't see them consciously at all. Put a tick next to each word if you are sure that you saw it during the test. Leave it blank if you don't recall seeing them.

Make	______	Göstermek	______
Give	______	Etmek	______
Take	______	Almak	______
Find	______	Düşmek	______
Show	______	Dövmek	______
Commit	______	Gerekmek	______
Set	______	İnmek	______
Place	______	Duymak	______
Keep	______	Yermek	______
Have	______	Bırakmak	______
Take	______	Dış	______
Go	______	Geç	______
Cast	______	Hoş	______
Deep	______	Yüksek	______
Cold	______	Beyaz	______
Strong	______	Alçak	______
Naked	______	Kısa	______
White	______	Yoğun	______
Long	______		
Thick	______	………………………………	
Sharp	______		
Wiry	______		
Heavy	______		
Open	______		
Middle	______		
Golden	______		
Rich	______		

APPENDIX R: ORIGINALITY REPORT

HACETTEPE UNIVERSITY
GRADUATE SCHOOL OF SOCIAL SCIENCES
THESIS/DISSERTATION ORIGINALITY REPORT

HACETTEPE UNIVERSITY
GRADUATE SCHOOL OF SOCIAL SCIENCES
TO THE DEPARTMENT OF ENGLISH LINGUISTICS

Date: 25/06/18

Thesis Title / Topic: Investigating the Relationship between L1 and L2 Collocational Processing in the Bilingual Mental Lexicon

According to the originality report obtained by myself/my thesis advisor by using the Turnitin plagiarism detection software and by applying the filtering options stated below on 23/06/18 for the total of 321 pages including the a) Title Page, b) Introduction, c) Main Chapters, and d) Conclusion sections of my thesis entitled as above, the similarity index of my thesis is 13 %.

Filtering options applied:

1. Approval and Decleration sections excluded
2. Bibliography/Works Cited excluded
3. Quotes ~~excluded~~ /included
4. Match size up to 5 words excluded

I declare that I have carefully read Hacettepe University Graduate School of Social Sciences Guidelines for Obtaining and Using Thesis Originality Reports; that according to the maximum similarity index values specified in the Guidelines, my thesis does not include any form of plagiarism; that in any future detection of possible infringement of the regulations I accept all legal responsibility; and that all the information I have provided is correct to the best of my knowledge.

I respectfully submit this for approval.

25.06.18
Date and Signature

Name Surname: Hakan CANGIR

Student No: N11146758

Department: English Linguistics

Program: Doctor of Philosophy in Linguistics in English

Status: ☐ Masters ☒ Ph.D. ☐ Integrated Ph.D.

ADVISOR APPROVAL

APPROVED.

Prof. Dr. Nalan BÜYÜKKANTARCIOĞLU

(Title, Name Surname, Signature)

APPENDIX S: RESEARCH ETHICS BOARD APPROVAL

T.C.
HACETTEPE ÜNİVERSİTESİ
Rektörlük

Sayı : 35853172/ 433-3009

10 Ekim 2016

SOSYAL BİLİMLER ENSTİTÜSÜ MÜDÜRLÜĞÜNE

İlgi: 20.09.2016 tarih ve 4853 sayılı yazınız.

Enstitünüz İngiliz Dilbilimi Anabilim Dalı doktora programı öğrencilerinden **Hakan CANGIR**'ın **Prof. Dr. Nalan BÜYÜKKANTARCIOĞLU** danışmanlığında yürüttüğü **"İki Dillilerin Zihin Sözlüğünde Gerçekleşen Birinci ve İkinci Dildeki Eşdizimli Kelime İşlemleme İlişkisinin Karşılaştırmalı Olarak İncelenmesi''** başlıklı tez çalışması, Üniversitemiz Senatosu Etik Komisyonunun **04 Ekim 2016** tarihinde yapmış olduğu toplantıda incelenmiş olup, etik açıdan uygun bulunmuştur.

Bilgilerinizi ve gereğini rica ederim.

Prof. Dr. Rahime M. NOHUTCU
Rektör a.
Rektör Yardımcısı

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