KARADENİZ TECHNICAL UNIVERSITY * THE INSTITUTE OF SOCIAL SCIENCES

DEPARTMENT OF WESTERN LANGUAGES AND LITERATURE

APPLIED LINGUISTICS MASTER'S PROGRAM

INVESTIGATION OF COLLOCATIONAL PRIMING IN TERTIARY LEVEL TURKISH EFL LEARNERS' MENTAL LEXICON

MASTER'S THESIS

Ahmet AKTÜRK

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ÖZET

Yabancı dil olarak İngilizce öğrenen öğrencilerin, İngilizceyi ana dil standartlarına uymayan ve doğal olmayan bir şekilde kullandıkları uzun zamandır bilinmektedir. Bununla ilgili olarak, öğrencilerin yanlış biçimlendirilmiş bir dil kullandıklarını ve İngilizceyi ana dili olarak konuşan kişilere göre söz dizinleri ile eşdizimli kelimeleri kullanmada başarısız olduklarını gösteren birçok çalışma Türkiye bağlamında yapılmıştır. Ancak yapılan bu çalışmalar, söz dizinlerini ve eşdizimli kelimeleri psikodilbilim açısından göz ardı etmektedir. Hoey'in (2005) eşdizimli sözcüklerin sadece metinsel değil aynı zamanda psikolojik olgular olduğunu öne sürdüğü dikkat çekici Sözcüksel Önceleme Teorisi'nden yola çıkılarak yapılan bu çalışmada, yabancı dil olarak İngilizce öğrenen Türk öğrencilerin, ana dil standartlarına uymayan dil kullanımlarının arkasında zihin sözlüklerinde eşdizimli kelimelerin bütüncül olarak temsil edilmiyor olabileceği vurgulanmaktadır. Başka bir ifadeyle bu çalışma, yabancı dil olarak İngilizce öğrenen Türk öğrencilerin doğal olmayan dil kullanımlarının arkasındaki psikodilbilimsel nedeni ortaya koymak için, fiillerden ve isimlerden oluşan eşdizimli akademik kelimelerin öğrenciler tarafından zihinsel olarak ne derecede işlendiğini araştırmaktadır. Bu amaçla, 136 kelime çifti içeren ve alanda da yaygın olarak kullanılan bir önceleme deneyi, diğer adıyla sözcüksel karar testi (LDT) tasarlandı ve Gümüşhane Üniversitesi'nde İngiliz Dili ve Edebiyatı okuyan 71 öğrenci ile söz konusu deney gerçekleştirildi. Birkaç oturumda gerçekleştirilen deneyde, katılımcılardan klavyede önceden belirlenmiş düğmelere basarak ekranlarında yanıp sönen kelimeleri İngilizcede yer alan veya yer almayan kelimeler olarak sınıflandırmaları istendi. Sonuç olarak, bu kelimeleri sınıflandırırken ortaya çıkan tepki süreleri, fiillerden ve isimlerden oluşan akademik eşdizimli sözcüklerin katılımcılarda zihinsel olarak öncelenmediğini ortaya koymuştur. Buna ek olarak, karma etkiler modeli analizi eşdizimli sözcüklerdeki ilk kelimelerin sıklığının katılımcılar için önemli bir etkiye sahip olduğunu göstermiştir. Deneyden elde edilen bulgular, yabancı dilde kelime edinme teorileri ışığında tartışılmış ve mevcut çalışmanın eksik kaldığı konuları tamamlamak üzere gelecek araştırmalar için önerilerde bulunulmuştur.

Anahtar Kelimeler: Yabancı Dilde Kelime Edinimi, Eşdizimli Kelime Önceleme, Sözcüksel Önceleme, Psikodilbilim

ABSTRACT

It has been long acknowledged that English as a foreign language learners use the language in a non-native-like and unnatural fashion. Regarding that, many studies in Turkish context have been undertaken in order to investigate language use of those learners suggesting that learners produce ill-formed language, and fail to use formulaic sequences and collocations as well as native speakers do in their linguistic performance. However, those studies fail to recognize formulaic sequences and collocations in terms of psycholinguistic framework. The current study was inspired by Hoey's (2005) influential Lexical Priming Theory which emphasizes that collocations are not only textual but also psychological phenomena. In this sense, this study underlines that non-native-like language use of Turkish EFL learners may stem from the fact that collocations are not mentally represented as a single unit in their mental lexicon. More precisely, the current study investigates whether academic verb+noun collocations are primed in tertiary level Turkish EFL learners' mental lexicon in order to uncover the psycholinguistic reason behind their non-native-like language use. To this end, a widely used priming experiment in the field, namely a lexical decision task (LDT), was designed including 136 word pairs, and 71 participants studying at the ELL department at Gümüşhane University were recruited in a computer laboratory. During the several sessions of the LDT, the participants were asked to classify the words flashing on their screens as words or non-words in English by pressing the pre-specified buttons on the keyboard. Their reaction times in response to the classification of the words concluded that academic verb+noun collocations are not primed in Turkish EFL learners. In addition, a mixed effect modeling analysis demonstrated that the frequency of the prime words in collocations has a significant effect while the participants process the collocations. The findings of the experiment were discussed in light of vocabulary acquisition theories in second language, and suggestions were provided for further research so as to fill the gaps of the current study.

Keywords: Vocabulary Acquisition in Foreign Language, Collocational Priming, Lexical Priming, Psycholinguistics

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LIST OF ABBREVIATIONS

L1   : First Language
L2   : Second Language
EFL   : English as a Foreign Language
ESL   : English as a Second Language
TEPAV   : The Economic Policy Research Foundation of Turkey
ELT   : English Language Teaching
ELL   : English Language Literature
PICAE   : Pearson International Corpus of Academic English
MI Score   : Mutual Information Score
LDT   : Lexical Decision Task
BNC   : British National Corpus
SOA   : Stimulus Onset Asynchrony
CEFR   : Common European Framework of Reference for Languages
ACL   : Academic Collocation List
MEM   : Mixed Effect Modeling

INTRODUCTION

Learning English plays a crucial role in Turkey as well as other developing countries where English is taught as a foreign language (henceforth referred to as EFL) considering the academic, economic, and political merits it provides for the country and those who achieve it. The report within the body of British Council and The Economic Policy Research Foundation of Turkey (TEPAV) states Turkey strives to become one of the world's top ten economies by the year 2023, and the country is very well aware of the fact that better economy, hence better higher education system is of utmost importance (West et al., 2015: 35). A better higher education system obviously necessitates an environment in which English is exploited by academicians, instructors, and students as it is a *sin que non* in the academic world. It is therefore fair to say that a better higher education system is almost inconceivable without having a good command of the English language. Furthermore, it is apparent that learning English is prioritized in the country not only in higher education but also in primary education in that 4+4+4 compulsory education, which was introduced in 2013, embodies English starting to be taught from the 2nd grade. Prior to the 4+4+4 compulsory education implementation, however, English would be taught from the 4th grade onwards (Republic of Turkey, Ministry of National Education, Board of Education, 2013, as cited in Çelik and Kasapoğlu, 2014: 4). What is more, as far as individual motives are concerned, Turkish citizens seem to have well grasped the importance of learning English. After the foundation of the Turkish Republic, the Turkish society underwent a rapid and dramatic modernization process. Ruled as the Ottoman Empire for hundreds of years, the new republic was now known to be a western country, which adopted western traditions and institutions. As a consequence of such process, a need of close relations with the west hence learning English emerged for individuals. Regarding that, Kırkgöz (2005: 160) states that Turkey at the time was aiming to modernize the country, which accelerated the process of establishment of many English-medium schools. Eventually, the number of nationwide English-medium schools by the year 1987 was 193 (Doğançay-Aktuna, 1998: 28). The fact that English-medium schools became common meant that more and more people aspired to learn English. Especially after 1980s, learning English was popular among individuals and it was considered instrumental for a brilliant career in almost all disciplines (Atay, 2005: 225).

Much as learning English is popular and considered vital in Turkey both in terms of the country's economic prospects and the individuals' career expectations, the quality is still a matter of question. To illustrate, according to another report within the body of British Council and TEPAV, Turkey typically attains poor scores and lags behind many countries on various tests of English language. The report goes on to underline that competence level of most students (over

90%) regarding English is elementary, and in spite of the fact that the students receive an abundant amount of English instruction (estimated to be 1000+hours), they cannot speak or understand English after graduating from high schools. Furthermore, English, which is supposed to be taught as a language of communication, does not go beyond a mere school subject (Özen et al., 2013: 5-52). Such statistics imply that prescribed guidelines as regards learning English are not fully met in Turkey. With respect to that, Kırkgöz (2005: 160) puts forward that the efforts of the Turkish governments in order to increase the quantity of English-medium schools are not reflected in terms of quality since a great many students seem to have difficulty in dealing with the requirements imposed by the academic community. In fact, the situation is evidently dire when English Language Teaching (henceforth referred to as ELT) and English Language and Literature (henceforth referred to as ELL) departments across the country are put under the scope as the students in those departments aim to become teachers of English. With respect to that, Kırmızı and Karcı (2017: 50) investigated the errors made by Turkish students of ELL and found that the students tend to make frequent errors (i.e. *wrong word choice*) in their language production. Taking the findings into consideration, the researchers recommend that the writing ability of the students need to be improved. Elsewhere, Üğüten (2009: 58) report that ELT students experience difficulties during the preparation and writing stages of paragraphs. Another study which indicates the quality of ELT departments and pre-service English teachers was carried out by Gürbüz (2006). According to his study, 67% of the students do not qualify themselves to teach English. He concludes that such dire situation in the ELT and ELL departments in Turkey require immediate attention (as cited in Alptekin and Tatar, 2011: 339). Those findings regarding ELT and ELL departments in Turkey demonstrate that learning English is problematic in Turkey even at higher levels and action must be taken in an attempt to unravel what lies beneath the surface. In other words, the reason why EFL learners in Turkey attain poor scores in English tests and lack quality in their language use needs to be discovered.

CHAPTER ONE

1. FRAMEWORK OF THE STUDY

1.1. Introduction

This chapter encompasses the background of the study, the statement of the problem, and the aim of the study. Accordingly, the research questions are presented in an attempt to lay the grounds for the methodology and the scope of the study. The chapter also discusses the significance of the study within a comprehensive framework. Finally, the operational definitions and the overview of the study are underlined in order to ease the reader's task.

1.2. Background of the Study

Based on the reports and relevant literature presented in *Introduction*, it seems there exists a quality problem concerning EFL learners in ELT and ELL departments in Turkey. The reports of British Council and the studies in the field (Gürbüz, 2006; Üğüten, 2009; Alptekin and Tatar, 2011) reveal that Turkish learners of English appear to be incapable of mastering English language as far as their language use is concerned. Such drawback requires urgent action so as to uncover the reasons behind the learner's low quality language use, and make suggestions on the matter. Although mistakes made by the learners during their language production could be simply attributed to grammar and vocabulary, the case at hand here could be much more complex. In this sense, the present study attempts to underline that the quality problem of ELT in Turkey, as discussed above, is echoed in unnatural and non-native-like language production by learners who study at ELT and ELL departments of universities. It is because learners who graduate from these departments are likely to ignore the naturalness and idiomaticity in language, which could result in incompetent second language learners who sound unnatural and non-native-like in their linguistic choices when they speak or write. Such incompetency of learners may partly stem from insufficient knowledge of formulaic language, collocational knowledge in particular. Formulaic language has long been acknowledged to be abundant in spoken and written language, and ensure fluent and natural language production (Granger, 1998; Wray, 2002; Biber, 2009; Durrant and Mathews-Aydınlı, 2011). As Schchenk and Choi (2008: 142) claim, merely paying attention to grammar, syntax, and vocabulary rather than top-down processes such as formulaic language can delimit seeing the whole picture regarding the trouble EFL learners experience in their linguistic performance. With respect to that, they assert that language users should attain knowledge of

formulaic language, besides language grammar. In this sense, formulaic language appears to entertain those concepts (Wray, 2000; Durrant, 2008; Nguyen, 2014; Ylisirniö, 2012). Bearing this in mind, only when a theory in which language is approached as a whole is adopted can we examine difficulties and problems experienced by EFL learners regarding their language use. It is because formulaic language, a phenomenon in which language is thought to be retrieved from the memory as a whole when the need arises, is highly abundant in written and spoken language performance of native language users, and insufficient use of it results in odd and non-native-like language use. Regarding that, Erman and Warren (2000: 37) suggest that almost half of the written as well as spoken discourse include formulaic language. In this sense, Wray (2002: 9) defines formulaic language as a set of words that can be argued to be pre-constructed. As such, formulaic language or formulaic sequences are considered to be readymade linguistic units which are not subject to grammar rules, and retrieved from the mental lexicon as a whole when the need arises rather than being generated from scratch. Wray's definition of formulaic language indicates that learners do not necessarily need to generate every single linguistic item every time they embark on generating language. Otherwise, their performance turns out to be unnatural if not unacceptable. That is to say, lack of formulaic language in students' writing or speech can result in non-native-like and ill-formed language even if they produce grammatically perfect sentences. From this point of view, it has been shown by several linguists that EFL learners find it difficult to generate acceptable forms of formulaic language (Chen and Baker, 2010; Burgos, 2015; Xu and Zhang, 2015). As a result, the outcome proves to be inferior to and different from what native speakers would do in similar contexts (Millar, 2011; Dontcheva-Navratilova, 2012). Obviously, Turkey harbours such an EFL context in which it is not likely to provide a rich environment for the learners to acquire formulaic language and textbooks used in the classrooms do not lay the ground for the learners to be native-like language users. Considering that those learners in the ELT and ELL departments in Turkey are on the verge of beginning a teaching career, unnatural and non-native-like language is not to be accepted. Moreover, such low quality in their performance is likely to make it challenging for the learners to cope with the requirements imposed in academic contexts.

1.3. Statement of the Problem

Having discussed the role of formulaic language and collocations as a subset of it regarding natural and native-like language use, the current study assumes that EFL learners fail to attain such quality since they may not be aware of the nature and merits of formulaic language, particularly they may lack collocational knowledge in their mental representations. That is to say, collocations may not hold priming effect in the learners' mental lexicon. Regarding that, According to Hoey's (2005) influential lexical priming theory, which he claims to be "a new theory of language" (ibid: 1), priming phenomenon is the reason why collocations exist in the first place. According to the author, every time native speakers encounter a word in language, they acquire its accompanying context including words and grammar structures. As a result, they come to be conditioned to

recognize specific words occurring together, which is spelled out as collocational priming. For instance, a native speaker would be likely to recognize a word like *commit* more quickly if they have seen that it occurs together with *crime*. Even though the native speaker can offer several alternatives occurring together with *commit*, his/her linguistic experience may prime the word *crime* in his/her mental representation in an attempt to sound rather natural compared to other alternative ways to express the same concept. In this sense, *commit* can be said to prime *crime* for most native speakers, and such priming effect would be found in language users' mental representations. From this point of view, naturalness in language is achieved through priming of collocations (ibid: 6-186). Bearing this in mind, the present study embarks on seeking whether such relationship is found in the mental lexicon of Turkish EFL learners studying at ELT and ELL departments of universities. That is, the study investigates collocational knowledge of the learners through the medium of psycholinguistics, which is echoed as collocational priming.

1.4. Aim of the Study

The current study centers on formulaic language, collocations in particular, as lack of collocational knowledge appears to be the scapegoat for the non-native-like language production by EFL learners. Collocations have long been acknowledged to be a very typical example of formulaic language by eminent linguists (Wray, 2002; Ellis, 2003; Durrant, 2008; Durrant and Schmitt, 2009; Fernandez and Schmitt, 2015). In this sense, most features of formulaic language are found in collocations (Wray, 2009: 232). Therefore, in this study, formulaic language and collocations are interchangeably addressed to refer to their advantages as far as the language use of EFL learners is concerned.

According to Fernández and Schmitt (2015: 96), just like in the matter of the formulaic language phenomenon, the linguistic choice of collocations is common among native speakers, and collocations can be of interest of EFL learners to increase their target language proficiency. As a matter of fact, insufficient use of collocations as well as misuse of them, as Fernández and Schmitt put forward, results in odd, unnatural, and non-native-like language use. The authors state that if EFL learners aspire to use language in an accurate and fluent fashion, they must have collocational knowledge. That is to say, rather than doing the third conditional again, EFL learners must add to their existing collocation repertoire as it is the only achievable way to reach advanced levels (Lewis, 2000, as cited in Ying and O'Neill, 2009: 182). From this point of view, the learners in the ELT and ELL departments in Turkey are to use language accurately and in a native-like fashion as they are likely to embark on careers to teach English as a foreign language. However, setting goals for EFL learners for them to reach native-like language standards has long been a hotly debated issue in literature (Jaworska et al., 2015: 502). In other words, comparing EFL learners with native speaker norms in a fashion where they are supposed to use language like native speakers do has been a controversial theme among scholars. Although it may be argued that it is not equitable to

expect learners to reach native-like standards in terms of their language production, EFL learners who study at ELT and ELL departments of universities should be aware of the fact that lack of formulaic language and erroneous collocational use in their language production may result in dire consequences considering that they are likely to become English language teachers. Regarding that, Gass and Selinker (1994: 372) state that collocational errors in language production lead to communication breakdowns. More precisely, wrong word choice in collocation sets is likely to change the meaning that is attempted to be conveyed through spoken or written medium. Bearing this in mind, the current study utilizes the terms *natural/unnatural* and *native-like/non-native-like* language production as two ends of a continuum rather than a goal that EFL learners must achieve. As such, the current study attempts to unearth the psychological reason behind EFL learners' unnatural and non-native-like language use by investigating priming effect in their mental lexicon rather than setting an unrealistic goal for the learners.

As discussed above, the reason why Turkish EFL learners tend to produce ill-formed and non-nativelike language could be their lack of collocational knowledge, and the current study seeks such knowledge in the first place; namely, learners' mental lexicon. With respect to that, Durrant (2008: 2) suggests that if collocations are mentally represented in native speakers, they are then sound targets to be taught, and they are really known by language users. Such equation underpins the goal of the current study in that Turkish EFL learners' mental lexicon is investigated through the lens of priming phenomenon in an endeavor to find out about their collocational knowledge. To this end, the study investigates whether academic verb+noun collocations listed by Pearson International Corpus of Academic English (PICAE) (Ackermann and Chen, 2013) are primed, mentally represented in particular, for Turkish EFL learners. Additionally, this study encompasses to what extent collocational and word level frequency have an influence on primings of the learners. Regarding that, Hoey (2005) suggests frequent collocations are bound to have a priming effect in the mental representations of language users. From this perspective, this study also aims to investigate to what extent corpus identified frequent collocations as well as constituents of collocations retain psychological reality for the learners. As Durrant and Doherty (2010: 127) claim, linking corpus data to psycholinguistic processes can yield certain implications for second language and vocabulary acquisition research. Finally, the current study sets out to establish to what extent proficiency levels of the learners have an influence in the process.

1.5. Research Questions

The present study particularly addresses the questions listed below in order to investigate collocational knowledge of tertiary level Turkish EFL learners by examining their mental lexicon within a psycholinguistic framework.

1. Does collocational priming exist for academic verb+noun collocations in Turkish EFL learners?
2. To what extent does collocational (and word level) frequency play a role in the process, if any?
3. To what extent does language proficiency have an effect on collocational priming in Turkish EFL learners, if any?

1.6. Significance of the Study

It has been long assumed that the proficiency levels of learners do not improve even after years of instruction where grammar is in the center of attention (Lu, 2017: 2). Based on my experience both as having been an EFL student for years and a teacher of English for seven years, I have come to observe that grammar is prioritized over vocabulary in EFL classrooms. Turkish EFL students learn English in teacher-centered classrooms where grammar is taught traditionally (Uysal and Bardakci, 2014: 6) and grammar instruction is prioritized (Süzer, 2007: 261) before learners enter ELT and ELL departments of universities. Even if those learners are able to produce grammatically correct and perfect sentences, the idiomaticity and naturalness in language is still a matter of question. That is, Turkish EFL learners do not appear to be in nativelike standards in terms of their language production.

As far as native-like second language is concerned, Wolter and Gyllstad (2011: 430) suggest that competent use of it is dependent on organized and relevant intra-lexical connections between words in the mental representations of those learning a second language. Here, what the authors imply by intra-lexical links between words is collocations which call for special attention due to their advantages presented above. In this sense, the current study investigates whether collocations are mentally represented in Turkish EFL learners' mental lexicon. As discussed in *Aim of the Study* section, on condition that collocations have psychological reality for learners, we can understand learners have really mastered them. Much research has been done with a focus on Turkish EFL learners by investigating their collocational knowledge. However, to my best knowledge, none of those studies except two (Cangır et al. 2017; Cangır, 2018) approach the issue from a psycholinguistic perspective. More specifically, there is not a single study investigating L2 collocations in L1 mental lexicon in Turkish context. Regarding that, the two psycholinguistic studies mentioned above were not concerned with Turkish EFL learners. Therefore, taking the paucity of psycholinguistic research regarding English collocational knowledge of Turkish EFL learners into consideration, it is worth investigating whether collocations hold psychological reality for Turkish learners of English, and the influence of Turkish as L1 on L2 English mental lexicon.

It is underlined in this study that discovering whether collocations are mentally represented in Turkish EFL learners may hold evidence manifesting learners' collocational knowledge. In

addition, the study is likely to yield certain insights and implications regarding second language and vocabulary acquisition as well as producing natural language in a foreign language. According to Wray (2002: 209), unlike native speakers, adult language learners concentrate on isolated items of collocations rather than retrieving them from their memory as a whole at the time of use. However, Schmitt (2008: 353) suggests that second language learners learn collocations best when they are implicitly exposed to the target language, implying that learners are capable of processing collocations as a whole. In other words, in contrast to what Wray claims, Schmitt implies that EFL learners can recognize formulaic language and process collocations as single units in their mental representations even when they are taught implicitly. Therefore, the current study is of value in that it is likely to guide EFL teachers to gain insights in terms of teaching collocations explicitly or implicitly. Moreover, the results of the study may demonstrate the psycholinguistic reason behind the unnatural and non-native-like language use of the learners, which may raise their awareness towards formulaic sequences and how collocations shape language based on psycholinguistic explanations. With respect to that, the findings of this study could manifest where Turkish EFL learners studying at ELT and ELL departments of universities stand in their endeavor to be native-like in their language use, and conform to the expectations of the academic world considering that they are likely to be teachers of English themselves. Furthermore, the findings could add to the existing literature regarding whether and how frequently occurring corpus identified collocations are mentally represented in Turkish EFL learners in order to make comparisons with native speakers. Finally, as the present study takes two different levels of language proficiency into consideration, the findings regarding such variable can be compared to the other studies which will be discussed in *Chapter Two*.

1.7. Operational Definitions

Collocations have been defined in different ways in accordance with various approaches and postulations. In this study, it is stressed that collocations are not only textual but also psychological phenomena. Therefore, it is believed that following definitions by Sinclair (1991) and Hoey (2005) serve the purpose of the study:

*"*The occurrence of two or more words within a short space of each other in a text.*"* (Sinclair, 1991: 170).

It is a psychological association between words (rather than lemmas) up to four words apart and is evidenced by their occurrence together in corpora more often than is explicable in terms of random distribution. This definition is intended to pick up on the fact that collocation is a psycholinguistic phenomenon. (Hoey, 2005: 5).

In light of the definitions presented above, the present study is also guided by the classification of collocations suggested by Benson et al. (2009: XIX-XXXIV) as provided in Table 1 and Table 2. Among the collocation types defined by the authors, verb+noun collocations will be held under the microscope in the present study, as they are widespread in language and pose great challenge for learners (Nesselhauf, 2005: 9). In addition, Turkish EFL learners seem to have difficulty in choosing the accurate verb in verb+noun collocations (Bıçkı, 2012: 85). As a consequence, in the present study, it is considered fruitful to investigate verb+noun collocations under the guidance of the definitions presented by Sinclair and Hoey.

Table 1: Classification of Grammatical Collocations

Grammatical Collocations	Examples
noun + preposition	*blockade against*
noun + *to* + infinitive	*it is a pleasure to work*
noun + *that* clause	*we reached an agreement that*
preposition + noun	*by accident*
adjective + preposition	*they were angry at everyone*
predicate adjective + *to* + infinitive	*it was necessary for him to work*
adjective + *that* clause	*she was afraid that she would fail the exam*
verb patterns	*they began to speak*

Source: Benson et al., 2009: XIX-XXIII

Table 2: Classification of Lexical Collocations

Lexical Collocations	Examples
verb + noun/pronoun	*set a record*
verb (eradication and/or nullification)+ noun	*reject an appeal*
adjective + noun	*strong tea*
noun + verb	*adjectives modify*
noun + *of* + noun	*a swarm of bees*
adverb + adjective	*deeply absorbed*
verb + adverb	*affect deeply*

Source: ibid: XXXI-XXXIV

It is also worth recognizing the definitions given below so as to be acquainted with the theoretical framework of this study. Furthermore, the definitions may prove useful in understanding the widespread methodology in psycholinguistics and priming research.

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

Collocate: The words that co-occur with the node in a collocation (Sinclair, 1991: 170).

Prime word: The first word in a collocation "which can prompt a language user to recall a particular target word." (Durrant, 2008: 10).

Target word: The second word in a collocation "preceded by prime words that are or are not related." (Frenck-Mestre and Prince, 1997: 482)

Native-like language: Considering that native-like language use is almost unattainable after a certain critical period in second language learners' language development (White and Genesee, 1996: 234), the current study defines the term native-like language as a continuum in which learners' language production is viewed in terms of naturalness, rather than as a goal that learners must achieve.

1.8. Overview of the Study

The current study includes four chapters. Having discussed the background, the aim, and the significance of the study in *Chapter One*, relevant literature concerning collocational knowledge and priming phenomenon is discussed in *Chapter Two*. As far as the methodology of the current study is concerned, the tools and procedures to investigate the above-mentioned research questions are detailed in *Chapter Three. Chapter Four* contains the results of the questionnaire and the experiment conducted for the sake of the study, and involves the discussion of the findings. Finally, pedagogical implications are drawn, and suggestions for further research are given in *Conclusion and Recommendations.*

CHAPTER TWO

2. LITERATURE REVIEW

2.1. Introduction

This chapter includes the theoretical background to formulaic language and collocational priming. The relevant literature and similar studies are thereafter listed and discussed in a fashion where the studies regarding collocational knowledge are approached by taking corpus methodology and priming phenomenon into consideration. Finally, the studies regarding collocational knowledge in Turkish context are presented and criticised in the chapter.

2.2. Theoretical Background to Formulaic Language and Collocational Priming

The theoretical stance behind formulaicity and collocations is embodied by Idiom Principle (Sinclair 1991), Pattern Grammar (Hunston and Francis, 2000), and Construction Grammar (Goldberg, 1995). Thanks to the advances brought by corpus linguistics, it is now possible to electronically and swiftly examine a larger proportion of written and spoken language, which in turn has featured new approaches of language description stressing the codependence of lexis and grammar. Below are brief descriptions of those models which are associated with formulaic language, hence collocations (as cited in Cangır, 2018: 42).

2.2.1. The Idiom Principle and Open-Choice Principle

During the process of language production whether spoken or written, words are not haphazardly applied to grammar rules in order to create meaning. That is to say, it is not very common in language that words have freedom of choice regarding which words they co-occur with. According to Sinclair (2004, as cited in Men, 2018: 9), there exists a phraseological tendency in which word combinations create meanings. In this respect, word combinations are formulaic language as an umbrella term, and collocations are a subset of formulaic language (Wray, 2009: 232). It is therefore assumed that isolated words do not carry the meaning in language. It is phrases – i.e. formulaic language, collocations, idioms, lexical bundles, etc. in which the meaning resides. From this point of view, Sinclair repeatedly established evidence that words are connected to each other, and meaning is obtained from contexts, and collocations play a key role to ensure meaning in

language (Moon, 2008: 243). To this end, Sinclair introduces two principles as to how language works in mind, named as the idiom principle and open-choice principle.

As discussed above, native speakers as well as writers do not generate language from scratch, they rather employ ready-made linguistic units when they write or speak. This is what Sinclair (1991) termed as the idiom principle. According to Sinclair, linguistic behavior of individuals is influenced by the idiom principle rather than the open-choice principle. In the former, the language is described as "a language user has available to him a large number of semi-preconstructed phrases that constitute single choices, even though they might appear to be analyzable into segments' (Sinclair, 1991: 110). To rephrase, there are certain word combinations to express certain concepts in language and they are readily available to language users. In this regard, collocations, which are inclined to occur with multiple words in language production (Schmitt, 2000: 76), encompass the idiom principle. However, in the open-choice principle, language has been traditionally acknowledged to be formed with single lexical items which are subject to generation of grammar rules. The qualitative difference between novice and expert texts originates from the fact that much of the language in expert texts is not generated from scratch; it is rather composed in accordance with the idiom principle (Groom, 2009: 23). Since EFL learners tend to employ what Kjellmer (1991: 124) has termed as "individual bricks" in their writing assignments rather than collocations, they happen to write in accordance with the open-choice principle, and the outcome turns out to be problematic in terms of native-like language use. Sinclair (1991: 79) also reinforces this claim by stating that students ignore the idiom principle as they use unidiomatic word combinations. In this sense, since many foreign language learners tend to ignore the idiom principle, they do not have collocational knowledge, and such insufficiency in turn causes problems in their language production.

Formulaic language and collocations have been discussed to ensure idiomatic and natural language use (Pawley and Syder, 1983; Sinclair, 1991; Wray, 2002). In this sense, they are ubiquitously found and widespread in spoken and written language productions of language users (Erman and Warren, 2000). Such pervasiveness of collocations indicate that the idiom principle is a sound explanation as to how language used by native speakers works in their mental lexicon. This suggests that EFL learners would enjoy natural and native-like language use once they have achieved the idiom principle in their language production. As stated at the outset of the current study, Turkish EFL learners who are on the verge of beginning an ELT career may be applying the open-choice principle when they process and produce English language. It is because the open-choice principle allows a wide range of alternatives to express certain concepts, which may hamper natural language use. However, the idiom principle entertains a framework where most idiomatic and natural choices are selected when using language. To illustrate, instead of choosing to utter a collocation like *fast food*, an EFL learner might say *quick food* or *rapid food* when the open-choice principle is applied in language. However, the idiom principle in this example would keep such

unidiomatic usage under control by enabling language users to remain idiomatic and native-like when their language use is taken into account. Considering how the idiom principle ensures natural language use, EFL learners are to take how words are naturally fused together into account instead of concentrating on individual words in their linguistic experiences. In other words, EFL learners would achieve native-like standards and conform to the requirements of the academic world providing that they do not attempt to create language from scratch with individual words, and employ formulaic language such as collocations in their language use. Therefore, the current study is instrumental in that it attempts to demonstrate in which end of the continuum Turkish EFL learners stand by taking the idiom principle and open-choice principle under its scope.

Having discussed the distinction as to how language works in mind as suggested by Sinclair (1991), it is worth reiterating the confluence of the idiom principle and open-choice principle distinction with the concept of formulaic language and collocations by directing attention to the current study. It is underlined in this study that Turkish EFL learners lack collocational knowledge which is echoed in their unnatural and non-native-like language use. Bearing this in mind, their lack of collocational knowledge could be stemming from the fact that collocations are not mentally represented in their mental lexicon. That is, collocations may not be primed in their mental lexicon as it takes place in native speakers, which is suggested by Durrant (2008). From this point of view, as long as collocations exhibit priming effect for EFL learners, there would be a room in which it can be argued that the learners apply the idiom principle in their language use. Therefore, the distinction between the idiom principle and open-choice principle underpins this study by encompassing formulaic language and collocational knowledge.

2.2.2. Pattern Grammar

Pattern Grammar (Hunston and Francis, 2000) is one of the theoretical stances describing how language works in mind. It suggests that every single word in language has particular patterns. To illustrate, the word *matter* frequently occurs with the indefinite article "*a*" as can be evidenced in corpora. Additionally, it is repeatedly followed by *of* and an *-ing* clause – i.e. *a matter of being truthful, a matter of getting the job done, a matter of producing more food, a matter of changing minds, a matter of teaching and programming,* etc. Such evidence indicates that the word *matter* or any word in English frequently appears to enjoy a typical phraseology. Therefore, it reinforces Sinclair's (1991) observation that words are inclined to occur with specific other words to a certain extent. More precisely, in a similar vein with Sinclair's idiom principle, pattern grammar postulates that a pattern in language is observed when certain words frequently occur together with certain other words. With respect to that, as far as formulaic language and collocations are concerned, it could be claimed that collocations are embodied in pattern grammar viewpoint of language because the elements of collocations have a tendency to occur together. Therefore, a collocation can also be a pattern of language in accordance with this viewpoint. Regarding that, Hunston and Francis

(2000: 51) categorizes verb+noun collocations as one of the types of patterns. As such, it can be considered that formulaic language and collocations have their theoretical background in pattern grammar framework.

With respect to where formulaic language and collocations reside in pattern grammar, it has been discussed above that formulaic language is acknowledged to be multiple words that are stored in mind as a whole rather than being subject to grammar rules, and that collocations are a subcategory of formulaic language. In addition, collocations are known to be combinations of words which are learnt as a whole "rather than by the process of placing together their component parts" (Palmer, 1993: 4). Taking those descriptions of formulaic language and collocations into consideration, there is no harm in saying that pattern grammar can be associated with formulaic language and collocations since both pattern grammar and formulaic expressions such as collocations directly attack the Chomskian viewpoint of language description. While the approach of pattern grammar and formulaic language are based on phraseology, and avoid distinguishing lexis from grammar, linguists in the Chomskian tradition maintain that language is made of "two kinds of mental tissue": "a lexicon of words" and "a grammar of rules" and that the main aim of linguistics is to portray extremely grammatical patterns ignoring lexical content (Pinker, 1999, as cited in Durrant, 2008: 13). However, as revealed above, Sinclair suggests that words are inclined to occur together with other words and grammatical patterns, implying that lexis and grammar are not independent of one another. In a similar vein, Hunston and Francis (2000: 3) suggest that all language is made of patterns which include a word occurring together with other words. Those descriptions of language by Sinclair, Hunston, and Francis indicate that unlike the Chomskian tradition, the proponents of pattern grammar and formulaic language reject a strict lexis-grammar distinction. According to those linguists, lexis and grammar depend on each other to create meaning in language. As a consequence, it would not be wrong to suggest that collocations and formulaic language as an umbrella term are in line with the model of pattern grammar in that they do not separate lexis from grammar, and contradict the Chomskian view of language.

Pattern grammar is associated with formulaic language and collocations by also Schmitt (2013) who puts forward that language users are capable of drawing out patterns from language input they encounter. That is to say, according to Schmitt, it is not innate faculties that determine what is acceptable and what is not in language. Rather, through linguistic experience language users "gain intuitions about which words collocate together and which do not." (2013: 4). From this point of view, Schmitt's description of pattern grammar can be observed in the theory developed by Hoey, which has been stated at the outset of the current study. To restate, Hoey (2005) claims that native speakers acquire words with their contexts, indicating that their mental lexicon is loaded with a set of information regarding which linguistic units occur together in language. They are then considered to be capable of telling whether certain word combinations such as collocations are acceptable in language or not. Based on this link between pattern grammar and collocational

priming, besides the idiom principle and open-choice principle distinction, the current study can be suggested to be guided by pattern grammar viewpoint. Specifically, it may be theoretically interesting to find out about how EFL learners as the participants of this study behave when the convergence of pattern grammar and collocations are taken into consideration.

2.2.3. Construction Grammar

Formulaic language and collocations as the key component of it (Moon, 1998: 243) seem to challenge the Chomskian traditions whose description of language is that words are put together from a mental tissue of lexicon in accordance with another mental tissue, which includes grammar rules. However, formulaic expressions; contrary to what the Chomskian view of language suggests, are not subject to grammar rules (Pawley and Syder, 1983; Wray, 2002) and make up a large proportion of any spoken or written text (Erman and Warren, 2000). That is, the proponents of formulaic language, who suggest it is highly abundant in language and stored in mind as a whole rather than produced in accordance with the grammar rules, attempt to describe language as being received and produced holistically while contradicting the generative grammar approach introduced by Chomsky (1964). As mentioned above, they are of the opinion that language grammar and lexis are united. In the same vein, construction grammar approach posits there is not a rigid separation of lexis and grammar (Golberg, 1995: 7). In fact, according to Buerki (2016: 16), construction grammar has surfaced from the discontent of generative grammarians' viewpoint that lexis and grammar are separate bodies. In addition to that, Croft and Cruse (2004: 225) argue that construction grammar surfaced since traditional approaches to the description of language do not suffice to give a satisfactory explanation for formulaic language and collocations.

Construction grammar as a post-Chomskian approach to the description of how language works encompasses formulaic language phenomenon and collocations in that it acknowledges that meaning lies in grammatical patterns along with individual lexical items. More specifically, it interprets the language as made of constructions which contain information regarding the arrangement of words, vocabulary, speech sounds, etc. (Croft and Cruse, 2004: 247). Bearing this in mind, the holistic nature of formulaic expressions would seem to suggest that they fit in the interpretation of construction grammar. Wray (2012: 233) reinforces this suggestion by stating that the proposition of construction grammarians that everything in language is made of constructions is one way to conceptualize formulaic expressions. It is because formulaic language encompasses the kinds of information presented by the construction grammarians as it is defined as a set of words which are brought from memory as a whole instead of being created from scratch. In light of those descriptions, it is acknowledged by construction grammarians that formulaic expressions such as collocations, idioms, lexical bundles, etc. are regarded as constructions since they are where lexicon and grammar join to achieve meaning in language.

2.3. Approaches to Collocations

Much research has been done in terms of collocations and collocational knowledge. However, various definitions of collocations have been put forward by linguists depending on their study. As a result, there seems to be much confusion as to how collocations are approached. Regarding that, Durrant and Mathews–Aydınlı (2011: 59) give a description of three main approaches to collocations which are named phraseological, frequency-based, and psycholinguistic approaches.

2.3.1. Phraseological Approach

The first approach to collocations has been called as phraseological approach, in which one of the constituents of a collocation does not have a literal sense (e.g. *meet deadlines, go green*) or in which the constituents of a collocation are so restricted that they cannot be easily replaced by another constituent (e.g. *flunk* cannot be easily followed by any noun other than *an examination*, *test*, or a course of study). More specifically, phraseological approach which is also called "Russian school of phraseology" (Durrant and Schmitt, 2009: 159) is inclined to define collocations as frequent word combinations containing transparent meaning and restricted elements. According to phraseological approach, at least one of the words in collocations needs to be transparent or compositional, otherwise they are considered free combinations (Gyllstad, 2009: 155). This can be illustrated with a word pair, say *comb hair*. In phraseological approach, *comb hair* is considered a free combination because both of its elements are transparent or compositional in meaning. That is, the interpretation of the pair can be extracted from its elements. If, on the other hand, both of the elements are non-transparent or opaque, that would be an idiom in accordance with the guidelines of phraseological approach (e.g. *hit the sack* is an idiom rather than a collocation as the meaning is not possible to be understood from the constituent words.) The other criterion of collocations proposed by phraseologists, A. P. Cowie being one of the most prominent, is commutability which signals that the elements of a collocation are restricted in a way that they cannot be substituted with another element. With respect to the criteria presented above, Cowie (1981) classifies four distinct types of word clusters (as cited in Nesselhauf, 2005: 14):

Free Combinations *(e.g. have breakfast)*

- the substitution limitation may be specified for semantic reasons
- constituents of the word cluster retain literal meaning

Restricted Collocations *(e.g. make a wish)*

- one of the constituents of the word cluster can be substituted to a certain extent, but it is arbitrarily limited
- at least one of the constituents of the word cluster has figurative meaning, and at least one of the constituents has literal meaning; the word cluster is compositional

Figurative Idioms *(e.g. grey area, meaning "something unclear")*

- the constituents of the word cluster can be substituted, even though it is rare
- the word cluster has a non-literal meaning, but it entails a literal understanding as well

Pure Idioms *(e.g. sink your teeth)*

- the constituents of the word cluster are impossible to substitute
- the word cluster has a non-literal meaning, and it does not entail a literal understanding

It must be noted, at this point, that the boundaries between those types of word clusters described above are not clear-cut. In other words, it is not possible to clearly set the limits and they should be seen as a continuum rather than as explicit types. In this sense, Cangır et al. (2017: 467) also assert that the fundamental problem with the classification described by phraseological approach is that it is not easy to set limits between the classifications suggested by phraseological approach. In a similar vein, another disadvantage of phraseological approach is that telling free combinations from restricted ones can only be made qualitatively. That is to say, quantitative criteria cannot be applied to distinguish free combinations from restricted collocations in phraseological approach. Even though statistical association measures such as t-score are possible to be used to determine how salient and significant a collocation is in a corpus, thresholds and values of those measures are determined subjectively (Lu, 2017: 15). Still, phraseological approach is fruitful in that semantic and qualitative analyses may help us to have a better understanding of collocational patterns (Gablasova et al., 2017: 173). Thus, numerous studies have been encouraged by phraseological approach (Benson et al., 2009; Cowie, 1998; Howarth, 1998, Lewis, 2000).

In the present study, phraseological approach is not taken into consideration as it only takes those academic collocations which meet certain frequency criteria regardless of their commutability and transparency. In other words, only those collocations with a minimum 3.0 MI score and 2.0 t-score will be addressed in the study. As a result, this study is encouraged by frequency-based and psycholinguistic approaches which will be described next, in that it takes statistics into consideration while acknowledging that collocations are psychological phenomena.

2.3.2. Frequency Based Approach

In frequency-based approach, collocations are viewed as word combinations that statistically tend to co-occur in spoken or written discourse. Bearing this in mind, collocations are approached in a similar vein with phraseological approach (e.g. there is a statistically high probability that the word *flunk* will co-occur with *test).* However*,* collocations in this approach may not necessarily have a restriction. For example, the word pair *make a cake* may be considered as a free combination in phraseological approach, whereas it may be a collocation in accordance with the guidelines described by frequency-based approach. It is because *make* and *cake* are not restricted, that is, they can be substituted by other elements. In this sense, frequency-based approach takes statistics into consideration, and describes collocations as "the relationship a lexical item has with items that appear with greater than random probability in its (textual) context" (Hoey, 1991: 7). What Hoey suggests is that collocations are co-occurrences of word pairs that are observed more often than chance predicts. Similarly, Nesselhauf (2005: 11-12) state that collocations in frequency-based approach refer to co-occurrences that are "more frequent than could be expected if words combined randomly in a language."

Frequency-based approach can be associated with corpus linguistics as basic terminology such as node, span, and collocate used in this approach have been put forward by a leading figure in corpus linguistics, Sinclair (1991). With respect to that, a node refers to a linguistic item (i.e. *a word*) whose collocational relationship with other words is investigated in a given amount of text. The other words occurring with the node from a particular distance are acknowledged as collocates, while span is called as the distance which is found between the node and its collocates. In light of such basic terminology, Sinclair suggests collocations are "the occurrence of two or more words within a short space of each other in a text" (ibid: 170). Here, what is meant by "a short space" is the span, which is suggested to be a four-word-space in the right and left-hand side of the node. To illustrate, in a sentence like *He went back to the house. When he opened the door, the dog barked,* the collocates of the node *house* are *went, back, to, the, when, he, opened,* and *"the"* according to frequency-based approach (Nesselhauf, 2005: 12). It is because those words are within a short distance of "*house",* and since they co-occur together they are considered to make collocations such as *the house, house when, when he*, etc.

Frequency-based approach posits that the more frequently word combinations occur together in language, the more probable they are to be established in the mental lexicon, and are possible to be considered as collocations (Cangır, et al., 2017: 467). In this sense, the advantage of frequency-based approach compared to phraseological approach seems to be quantitative criteria such as frequency measurement rather than intuitions with which phraseologists decide what is considered as a collocation and what is not. However, a major disadvantage of frequency-based approach is that it takes performance into account while ignoring competence (Howarth, 1998: 26). That is to

say, focusing on observable frequency data in a corpus without taking notice of semantics may unearth word pairs that are not considered as collocations by native speakers. Take the sentence *He opened the door* for instance. According to the criteria described by the frequency-based approach, *the door* could be counted as a collocation. However, the definite article *the* is ubiquitous in any written or spoken language performance. Therefore, it would not be wrong to state that *the door* is not a collocation since *the* does not entertain a significant value. The word combination o*pen the door;* on the other hand, can be considered as a collocation because of the fact that *open* by itself is not as much frequent as *the,* and it is likely to co-occur with *door.*

Taking only observable frequency data into consideration without noticing semantic aspects could mislead researchers if they aim to investigate why collocations exist in the first place. It is acknowledged that frequency-based approach is helpful in spotting collocations in language rather than explaining why there are collocations in language. Regarding that, Hoey (2005) argues that statistical measures in explaining why there are collocations in language are not sufficient. In his influential book, he claims that he develops a new language theory named as lexical priming theory in which it is proposed that collocations are "a psychological association between words" which is merely "evidenced by their occurrence together in corpora more often than is explicable in terms of random distribution" (ibid: 5). Much as Hoey himself was among the proponents of frequency-based approach, in his book, he appears to be discontent with frequency-based definitions of collocations, and addresses psycholinguistic definitions (Vural, 2010: 10). In the same vein, Cangır, et al. (2017: 467) underline that collocations described by frequency-based approach have a tendency to be insufficient in terms of psycholinguistic explanation. Therefore, as stated above, the present study incorporates frequency-based and psycholinguistic approaches since only verb+noun collocations whose MI and t-score levels are above a certain threshold will be investigated in terms of collocational priming.

2.3.3. Psycholinguistic Approach – Lexical Priming Theory

Another approach described by Durrant & Mathews – Aydinli is psycholinguistic approach where collocations are acknowledged as a set of words which are mentally represented in users' minds. The collocations in this approach are holistically stored or the constituents of collocations may be associated with one another. Psycholinguistic approach is consistent with the preceding ones given above in that both restriction of elements in collocations and their high probability to co-occur indicate that there is psycholinguistic association to a certain extent (Durrant, 2014: 447). From this point of view, Hoey (2005: 8) asserts that all words in language are mentally primed for collocational use and that collocations must be defined in psychological terms rather than statistical ones. Therefore, lexical priming theory which has been put forward by Hoey enables us to define collocations in terms of psycholinguistic mechanisms.

The problem with phraseological and frequency-based approaches is that neither of those gives an account of why collocations exist in spoken or written discourse. As Hoey (2005: 4) puts forward, the reason "why collocations should exist in the first place" is not adequately explained with frequent co-occurrence phenomenon. According to him, collocations should be acknowledged not only as textual but also a psycholinguistic phenomenon. Collocations, therefore, point out the presence of "a psychological association between words" which is simply "evidenced by their occurrence together in corpora more often than is explicable in terms of random distribution" (ibid: 5). From this point of view, the psychological association between the constituents of collocations has come to be known as priming, whereby every single word in spoken or written discourse is loaded to be used in company of certain other words. He claims that a priming word can trigger an individual to recall a particular target word. For example, a word such as *father* is reacted faster providing that a language user has heard or seen an associated word before, such as *mother*, than it is if he or she has received an irrelevant word in his/her input such as *pencil*. Here, *father* is considered to prime *mother*. In this sense, Hoey suggests that the decision of which word to use following a certain word is determined by our experiences with those words. Thus, all our knowledge regarding a word including collocational knowledge is a product formed as a result of our encounters with that word. Since every human being has a unique experience with the language, it is quite inevitable that the language use of EFL learners sounds non-native-like and unnatural to their readers or listeners. In other words, the priming of a particular word for an EFL learner may not be in harmony with that of another person, such as a native speaker. Although it is wrong to say that any set of primings are correct and another incorrect, it can be acknowledged that the primings of any language user may not be in agreement with their potential readers or listeners (ibid: 186). Hoey's account of priming indicates that much as EFL leaners as well as learners in ELT and ELL departments are able to produce grammatically perfect sentences, their performance is likely to be odd compared to native speaker standards as their primings may not be in harmony with native speaker primings.

With his lexical priming approach, Hoey is in part at odds with Generative Grammar (Chomsky, 1956) and takes the matter from a psycholinguistic point of view (as cited in Cangır, 2018: 68). According to Chomskian tradition, the main objective of linguistics is to describe language users' competence rather than their linguistic performance. With respect to that, Chomsky expresses that he is interested in internalized language which accounts for the abstract linguistic system in language users' minds. In contrast, Hoey (1991; 2005) and Sinclair (1991) is concerned with externalized language which is evidenced by corpora. According to them, focusing on competence of language users and ignoring performance does not make sense in that large-scale corpora is adequately powerful to explore how language works. From this point of view, Sinclair states that lexis and syntax are inseparable entities, which is observed in performance of speakers or writers of a language. The fact that lexis and syntax depend on each other is also observed by Hoey who puts forward the lexical priming theory on the issue. With respect to that, he suggests

that words in a language are primed to take place together with particular words and grammatical units. Such priming effect is echoed in the performance of language users in that they are conditioned to use pre-constructed items rather than generating language from scratch. In this sense, these observations have been acknowledged to be outcomes of lexical priming theory (Durrant, 2008: 15). The author further claims that primings are cumulative outcomes. That is to say, priming is the outcome of several confrontations with a word in written or spoken discourse. The word, therefore, "becomes cumulatively loaded with the contexts and co-texts in which it is encountered, and our knowledge of it includes the fact that it co-occurs with certain other words in certain kinds of context" (Hoey, 2005: 8). Besides being cumulative products, primings are also partially idiosyncratic to individuals. Here, what the author implies can be argued to be the reason why EFL learners appear to be unnatural and non-native-like in their language production. More precisely, since primings are claimed to be idiosyncratic, the primings of native speakers and second language learners may not be consistent with each other. In this view, the current study takes priming phenomenon into account to investigate collocational knowledge in mental representations of Turkish EFL learners. Therefore, it is worth reiterating at this point that this study merges frequency-based and psycholinguistic approaches to investigate collocational knowledge of Turkish EFL learners as it recognizes that collocations are not only textual but also psychological phenomena.

2.4. The Importance of Collocations in ESL/EFL Context

It was traditionally acknowledged that vocabulary was only to do with single words and word families (Koç, 2006: 19). However, it has been shown in literature that mastering a word is not only knowing about the interpretation of isolated words but also having a good command of knowledge with which language users can tell what particular words co-occur with other words. In this sense, Nation (1990: 13) asserts that knowing a word includes knowledge regarding syntax, semantics, orthography, and the collocations of the word. Ying and O'Neill (2009: 181) also state that collocations have been acknowledged as an important feature of learning languages since being able to combine words in order to express meaning is fundamental in language use. In addition to the fact that collocational knowledge is a must to master language, collocations are abundant in the written and spoken performances of native speakers (Erman and Warren, 2000: 37). Such suggestions indicate that collocations are a prerequisite for learners to be natural and native-like in the second language.

Collocations have been deemed to be a favoured area of research since the advent of computer technology and corpus linguistics. However, research concerning learners' use of collocations demonstrates that their utterances lack idiomaticity because they fail to apply the idiom principle (Sinclair, 1991: 79), and they excessively rely on "creative" word clusters (Eyckmans, 2009: 139). As a result, much of the language produced by learners appears to be odd

and non-native-like although they are grammatically acceptable. Having a good command of collocational knowledge, therefore, is considered to be crucial in terms of native-like and natural language use. In the same vein, Durrant and Schmitt (2009: 159) put forward that collocations as "semi-preconstructed phrases" or "psychological associations between words" are essential for language learners considering that they desire to use collocations like native speakers do.

Collocations which are "frequently recurring lexical patterns, often with specific semantic and syntactic restrictions" (Henriksen and Staehr, 2009: 224) are considered as a subcategory of formulaic language. Comprehensive knowledge of formulaic language, collocations in particular, is an integral part of communicative competence, which makes it possible for native speakers to be fluent and idiomatic (Pawley and Syder, 1983: 191), and enables individuals to conform to social expectations (Wray, 2002: 92). As far as second language learners are concerned, collocations are considered to be an opening passage to the new language and they are suggested to support learners to be more natural as far as their language production is concerned. In addition to the previously mentioned merits of collocations, that is, they enable learners to be native-like, it is also possible that they allow learners to take on group identity (ibid.).

Having discussed that collocations appear to be crucial in gaining native-like fluency, it is worth noting here that they are also crucial for efficient comprehension (Men, 2018: 1). According to Hunston and Francis (2000: 271), second language learners do not necessarily have to process every single word when they have sufficient collocational knowledge in their mental lexicon. In other words, taking into account that there is a great number of collocations at their disposal, their comprehension is facilitated as they do not have to take notice of every word when they listen or read. The authors also claim that collocational knowledge can be helpful for second language learners in that they can form meanings even when they fail to hear certain words in speech. In a similar vein, Kjellmer (1991: 124) puts forward that second language learners attend to language in a quite short time with no pauses or hesitations on condition that they are equipped with multiword units. The author further claims that such gear made of collocations encourages learners to be more active as regards social communication. Moreover, as stated above, learners will find it more unchallenging to read or listen and become more capable in the target language as they are acknowledged to instantly recognize preconstructed units such as collocations.

Pertaining to the importance of collocations, errors stemming from collocations may lead to misunderstanding or ambiguity. With respect to that, Gass and Selinker (1994: 372) state that a sentence containing a grammar error may not necessarily result in communication breakdown. A sentence where collocational error can be observed, on the other hand, may lead to misunderstanding. For instance, Turkish EFL learners who fail to use collocations tend to say, "I make breakfast every morning" instead of "I have breakfast every morning" (Koç, 2006: 22). Such utterance indicates that the learner cooks or prepares breakfast for somebody else, which causes

misunderstanding. Obviously, what the learner attempts to mean in this example is that he/she eats breakfast every morning. On the contrary, suppose that the same sentence is generated with an error in terms of grammar such as "I have breakfast yesterday." In that case, it can still be understood that the learner attempts to state something related to eating breakfast rather than preparing it. Regarding the example above, it can be claimed that the grammatical error is not as instrumental as the collocational one. Therefore, collocations are of great importance in ESL/EFL contexts as insufficient knowledge of them may lead to misunderstanding and communication breakdown.

All in all, it has been stressed at this section that collocations are instrumental in ESL and/or EFL context in that they are considered to be one of the prerequisites to know a word and master vocabulary (Nation, 1990: 13). Moreover, they are pervasive in written and spoken language, and they enable second language learners to be more native-like and natural when they speak or write (Pawley and Syder, 1983; Kjellmer, 1991; Wray, 2002). Besides that, as mentioned above, being competent with regard to collocations assists comprehension (Kjellmer, 1991; Hunston and Francis, 2000). Last but not least, the fact that collocational errors are among the most serious ones (Gass and Selinker, 1994; Meara, 1984) brings them to the forefront in second language learning context. This study takes how important collocations are into account considering the reasons presented above, and investigates collocational priming in Turkish EFL learners, which is the psychological explanation to why there appear collocations in language production (Hoey, 2005: 3-5).

2.5. A Review of the Studies on Collocational Knowledge

As indicated in *Introduction*, research concerning collocational knowledge of EFL learners appears to be lacking psycholinguistic framework. Most studies have investigated collocational knowledge of learners through corpus methodology. In this sense, following is *Corpus-Based Studies of Collocational Knowledge* section in which studies employing corpus tools are presented. Further, psycholinguistic research with a focus on priming phenomenon is discussed in *Studies Investigating Collocational Priming* section.

2.5.1. Corpus Based Studies of Collocational Knowledge

Lexis was conventionally recognized to be inferior to grammar in ESL/EFL context (Lu, 2017: 31). Even though grammar was prioritized in language teaching, lexis has been given prominence as of late (Laufer, 1997: 140). With regard to the studies in which lexis is investigated, Granger (1998: 145) states that collocations have been placed emphasis at an increasing rate since the mid-1980s. First of all, she states that the syntagmatic study of lexis has flourished following the emergence of lexico-grammar notion, which has been encouraged by the studies conducted by

eminent corpus researchers. As aforementioned, the dichotomy of the idiom principle and open-choice principle, pattern grammar, and construction grammar viewpoints have stressed the co-dependence of lexis and grammar, which encouraged the studies investigating formulaic language and collocations. Secondly, according to Granger, corpus linguistics led the way for investigation of collocations, hence the study of lexis thanks to the advent of computers. Finally, the author claims that pragmatics has grown into a paramount area of study in linguistics as well as in EFL, and that pragmatic competence plays a vital role in learners' competence. According to her, a good number of pragmalinguistic rules enjoy formulaic nature and this reality has been necessarily instrumental in featuring the syntagmatic study of lexis, hence collocations (ibid).

As far as corpus-based studies investigating collocational knowledge are concerned, Gitsaki (1999) carried out an in-depth study of collocations investigating collocational knowledge of second language learners taking their English language proficiencies into account. The study investigated 275 Greek learners of English at varying levels of proficiency with the use of essays, translation, and cloze tests. According to the results of her study, there was a significant difference among the learners as far as accuracy and use of collocation types are concerned. Moreover, with respect to the use of lexical and grammatical collocations, it was found that the post-intermediate level of learners was the most successful of all groups. As to the collocation types, lexical collocations appeared to be more problematic for the learners than grammatical collocations. Among the 37 types of collocations investigated, the learners had the most difficulty with verb-noun collocations. The study also indicated that the higher the learners' proficiency levels are, the more collocational knowledge they have. Last but not least, the development of collocational knowledge was found to occur in a gradual way, and receiving two years of instruction, exposure besides maturation, the learners were found to improve their collocational use.

Elsewhere, De Cock et al. (1998) investigated the collocational competence of EFL learners. They made use of two comparable corpora, which are made of informal interviews of native speakers and French EFL learners who have advanced proficiency levels. Both the learners and the native speakers were university students between the ages of 19 and 25. The software they used was capable of extracting recurrent two-, three-, four- and five-word combinations. With respect to that, they looked into the relative frequencies of those word combinations in the native speaker and learner interviews. According to the results of their study, the learners whose proficiency levels were advanced were found to use collocations, they even used more collocations than native speakers did. As a result, the authors arrived at the conclusion that advanced learners brought the idiom principle into play in their linguistic choices. However, the collocations used by the learners appeared to differ from the collocations used by the native speakers as regards the preference of certain favorite collocations and their relative frequencies, syntactic uses and pragmatic functions.

Similarly, Granger (1998) also investigated collocational knowledge of EFL learners. In the study, she employed two comparable corpora composed of essays written by French learners of English and native speakers. Her hypothesis was that the learners would not apply the idiom principle. That is to say, she expected the learners would employ what Sinclair (1991: 109) has termed as "the open-choice principle" in their essays, and they would use what Kjellmer (1991: 124) has called as "individual bricks" rather than pre-constructed units. To achieve this end, she looked into adverb-adjective lexical collocations in two corpora. More particularly, she studied amplifiers which have an ending as "-ly" such as *completely, bitterly, totally,* etc. According to the results of her study, the learners and native speakers used the maximizers such as *absolutely, entirely, totally* within approximately the same frequency. However, the study demonstrated that the boosters such as *deeply, strongly, highly* were much more frequently used by the native speakers. At the end of the study, she concluded that the learners had a tendency to overuse certain favorite items, which lacks diversity. Such finding indicating that the linguistic performance of the learners lacks diversity is in harmony with the results of the study carried out by De Cock et. al. (1998), which has been described above. From this point of view, Granger (1998: 156) put forward that the narrow use of particular linguistic units by the learners could be named as "islands of reliability", which they appeared to feel confident with. Moreover, based on the findings of her study, Granger also concluded that the fewer collocations used by the learners compared to the native speakers stemmed from the fact that the learners' native language had an impact on them. Finally, the study revealed that the learners underused native-like collocations, whereas they overused unnatural ones, which verified her hypothesis that the learners had a tendency to use individual bricks and apply the open-choice principle in their essays.

In a similar vein with the study conducted by De Cock et. al. (1998), Nesselhauf (2005) set out to investigate lexical verb+noun collocations in essays written by learners. The learner corpus she analyzed was made of argumentative essays written by English learners whose first languages were Austrian and German. The study manifested that the learners used too many erroneous collocations. That is, even though the learners employed collocations in their linguistic choices, they used them in a wrong fashion. Thus, she concluded that collocations were worth further studying. This particular finding is in harmony with the studies conducted by Granger (1998) and De Cock et al. (1998) in that EFL/ESL learners were inclined to overuse certain collocations with which they were confident. In addition, the study revealed that the learners were inclined to employ too few native-like collocations, which was also demonstrated in research conducted by Granger (1998).

It is worth noting here that the findings of corpus-based research which have been reported above seem to be in agreement with one another. That is to say, English as a foreign or second language learners apparently make use of collocations in their essays. However, much as collocations used by the learners are grammatically acceptable, they are unnatural, and sound non-

native-like. In addition to that, the studies presented above show that learners do not use collocations as much as native speakers do, and overuse certain collocations that they are confident with. It is also evident that the first language of learners has an impact on them when they employ collocations in their linguistic preferences.

2.5.2. Studies Investigating Collocational Priming

As far as research that has been conducted to investigate collocational knowledge with a focus on psycholinguistic framework is concerned, there are a few studies which look into collocations and collocational competence by making use of priming theories (Hodgson, 1991; McKoon and Ratcliff, 1992; Williams, 1996; Frenck-Mestre and Prince, 1997; Durrant, 2008; Wolter and Gyllstad, 2011; Wolter and Yamashita, 2014) Even though each study described below appears to focus on a variety of variables regarding participants, stimuli, etc., they are related to the present study in that they aim to find out about priming phenomenon.

To begin with, Hodgson (1991) made use of a lexical decision task (LDT) in which the subjects were displayed a word or non-word for them to make a decision in between, the methodology of which was described by Jiang (2012: 4), in an endeavor to investigate priming in antonyms (e.g. *hatred-love*), synonyms (e.g. *company-business*), conceptual associates (e.g. *dove-peace*), phrasal associates (e.g. *foul-ball*), co-ordinates (e.g. *mist-rain*), and superordinates-subordanites (e.g. *symbol-letter*). Unfortunately, the author does not provide any information as to how those prime-target pairs were constructed for his study, but he states that the pairs employed in the study were supposed to be unequivocal examples of the categories they belonged to. Regarding the participants in his study, they were all native speakers of English. According to the results of the study, priming could be found in all types of prime-target pairs mentioned above.

Another early study in which LDT was employed to investigate priming between semantically related pairs was conducted by McKoon and Ratcliff (1992). With respect to that, the study aimed to find grounds for collocational priming. To this end, the authors made use of a small scale corpus, which was made of news items, and chose 40 target words from it. For each target word, there was a highly related free-association prime, a prime with a high t-score, and another prime with a low t-score (e.g. *baby: child, hospital, room*). Besides the targets and prime words used, there were 309 filler words and 600 non-words in the study. The study included 52 participants who responded to both the target and prime words in the LDT. The study revealed that the fastest response times were found within highly related free-association prime, while the slowest response times occurred with the unrelated prime. Even though the authors were aware of the fact that the corpus they used was questionable in terms of representativeness, they tentatively suggest that statistical measures such as t-score calculated from larger corpora could predict priming effects.

Elsewhere, Williams (1996) employed an LDT and pronunciation tasks in a series of experiments where he seeks to measure priming within prime-target pairs composed of semantically similar sets (e.g. *suitcase-bag*), coordinates (e.g. *chair-stool*), collocates (e.g. *salt-pepper*), and associates (e.g. *hammer-nail*). The participants in the experiments were university learners at Cambridge University. The findings of the study revealed that the collocates which were rated to be highly familiar by the participants retained significant priming (*Experiment 1*). Unfortunately, Williams does not provide sufficient corpus and frequency data to draw conclusions as to the effects of co-occurrence on priming. In addition, the language backgrounds of the participants were not clearly provided by the author. However, since the participants were studying at Cambridge University, the significant priming effect could be argued to be belonging to native speakers of English.

Another study concerned with collocational priming was carried out by Frenck-Mestre and Prince (1997). Their study stands out considering the aforementioned studies in that it deals with priming taking the second language acquisition into account. The authors employed LDT in an effort to deal with the question regarding how mental lexicon is constructed in the target language (*Experiment 1*). To serve the purposes of the study, antonyms (e.g. *dead-alive*), synonyms (e.g. *wide-broad*), and collocations (e.g. *cook-meal*) in particular were investigated as those pairs were considered to form the word meaning for a native speaker. The number of the participants taking part in the study was 60, and they were distributed into three different groups. Each group consisted of 20 participants who were native speakers of English, proficient non-native speakers, and non-proficient non-native speakers. The word pairs used in the study were all frequently occurring ones, and they were presented in English in the LDT. There were 60 prime-target pairs which were evenly distributed into the groups of antonyms, synonyms, and collocations. The collocations employed in the study consisted of verb and noun pairs, and they were highly frequent in the corpus they used. The findings of the study demonstrated that there was a restricted amount of collocational priming when non-native speakers were taken into consideration.

To address the correlation of co-occurrence phenomenon and priming, Durrant (2008: 2) assumed that frequent collocations are found in the mental representations of native speakers. In his thesis, Durrant sets out to investigate the connection between co-occurrence phenomenon in corpora and priming. He accepts it is theoretically interesting to examine whether collocational knowledge of native speakers can be reasonably outlined taking lexical priming theory of Hoey (2005) into consideration. According to him, there is no convincing evidence including the findings of the studies presented above to support Hoey's theory. In an attempt to compensate for the paucity of research concerning collocational priming evidence, he conducted an experiment which aimed to investigate whether frequently occurring collocations in a corpus are represented in the mental representations of native speakers of English. In the first experiment, a total of 80 priming and target words were utilized. To serve the purposes of the study, an LDT was employed with 22

native speakers from University of Nottingham. According to the results of the study, reaction times in the LDT were faster as regards collocations. Therefore, the findings established that the assumption of frequently occurring collocations in a corpus are represented in the mental lexicon of native speakers. As far as non-native speakers are concerned, Durrant conducted another experiment in which he used a cued recall test with 12 proficient non-native speakers learning English from various language backgrounds rather than an LDT so as to investigate Wray's (2002) claims regarding the retention of formulaic sequences from the mental lexicon. Following a controlled training session, the participants were supposed to evaluate adjective+noun collocations on a Likert scale by taking naturalness into consideration. In other words, the non-native speakers were supposed to rate how natural adjective+noun collocations appear to them. The results of the recall test manifested that non-native speakers partly retrieve formulaic language from their mental lexicon unlike what Wray suggested.

Another study handling collocational knowledge was conducted by Wolter and Gyllstad (2011) in which the authors investigated the effect of native language on collocational priming. The authors particularly aimed to find out whether congruent verb+noun collocations enabled faster recognition compared to incongruent verb+noun collocations in an LDT. In a similar vein with Durrant (2008) the authors made use of a corpus to extract collocations to be used in the study. 33 of the collocations used in the study were congruent, meaning that they had direct equivalents in the native language of the participants (e.g. *give an answer – ge ett svar*). There were also 33 incongruent collocations in the study. Finally, 33 unrelated verb+noun collocations were used to compare priming effect for the congruent and incongruent collocations. The participants who took part in the study were native speakers of English. In addition, there were non-native speakers whose native language was Swedish. The results of the study demonstrated that not only the congruent but also the incongruent collocations were facilitated faster for the native speakers. That is to say, there was a significant priming effect in the mental lexicon of the native speakers. As regards the non-native speakers, there was a significant priming effect for incongruent collocations over unrelated verb+noun pairs.

In a rather recent study carried out by Wolter and Yamashita (2014), the potential influence of collocations found in Japanese on the representation of English collocations was investigated. The authors used an LDT like the studies mentioned above to measure such effect. The items in the study were formed taking the native language of the participants into consideration. The first category of items was composed of collocations that were only acceptable in Japanese, which was the first language of the participants. That is to say, they were English translations of Japanese collocations. The second category of items included collocations which were not found in Japanese, indicating that they were incongruent collocations as far as English and Japanese languages are concerned. Finally, the last category of items was non-collocations that were used in order to measure relative response times in comparison with Japanese only and English only

collocations. The participants of the study were one group of native speakers of English and two groups of non-native speakers who were intermediate and advanced level Japanese EFL learners. At the end of the study, it was found out that the native speakers processed both types of collocations faster than the non-native speakers. That is, Japanese EFL learners were not found to be processing collocations faster than native speakers, implying that collocations are not mentally represented in non-native speakers. Therefore, the conclusion drawn by the authors was that the lexicon in non-native speakers is not activated when incongruent collocations are being processed.

The description of the studies above suggests that there is little research measuring to what extent verb+noun collocations are facilitated and represented in the mental representations of non-native speakers. Although Frenck-Mestre and Prince (1997) suggest that there is a limited amount of priming in terms of verb+ noun collocations among non-native speakers whose first language is French, it may be instrumental to see whether and to what extent verb+noun collocations are processed for Turkish learners in the current study. It is because Turkish verb+noun collocations are constituted differently from English and French. For instance, a verb+noun collocation like *make a call* is translated into French as *lancer un appel*, indicating that the word order is the same in both languages. However, the same collocation in Turkish is *görüşme yapmak*, in which the word order is in the opposite direction. Therefore, the current study is instrumental in reinforcing what Frenck-Meste and Prince's study manifested by bringing another first language under the spotlight. Likewise, two similar studies conducted by Wolter and Gyllstad (2011) and Wolter and Yamashita (2014) can be theoretically interesting when the potential yield of this study is taken into consideration. As far as those two studies suggested, incongruent verb+noun collocations, which are not found in the first language of the participants, appear to be primed in Swedish learners of English while incongruent verb+noun and adjective+noun collocations do not show such effect in Japanese learners of English. From this point of view, this study could contribute to the abovementioned studies with similar methodology and participants from a different L1 background. Another link that can be drawn from the relevant literature to this study is echoed within the frequency of collocations. As Durrant (2008) argued, frequently occurring and corpus identified collocations hold a significant effect in native speakers. Bearing this in mind, it can be suggested that the potential findings of the present study may contribute to the relevant literature in light of Durrant's study regarding the comparison of native speakers and EFL learners in terms of mental representation of frequently occurring collocations. Finally, as far as the other experiment in Durrant's study demonstrated, high proficiency level learners can retain adjective+noun pairs as single units from their memory while processing language unlike what Wray (2002) suggested. With respect to that, this study may prove pivotal regarding whether EFL learners at different proficiency levels can process collocations as a whole. In other words, the study is likely to contribute to the existing literature discussed above in that psychological reality of academic verb+noun collocations is attempted to be investigated with Turkish EFL learners.

2.6. Research on Collocational Knowledge in Turkey

Collocational knowledge has been studied in Turkey mainly from the perspective of corpus linguistics and second language teaching rather than taking priming phenomenon into consideration. The research in this context seems to have primarily been concentrating on development of collocational knowledge of learners and the use of several collocation types by learners. To illustrate, Bağcı (2014) and Koç (2006) investigated collocational knowledge and collocational awareness of Turkish EFL learners of Ankara University where they studied at the preparatory school. As far as collocational knowledge of Turkish EFL learners is concerned, Bağcı (2014) aimed to compare two different proficiency levels of learners. The results demonstrated that advanced level learners were significantly more successful than pre-intermediate level learners in the receptive and productive tests employed in the study. Koç (2006) was concerned with collocational awareness of EFL learners similar to the ones in Bağçı's study. She employed an experimental design in which she aimed to investigate to what extent teaching collocations explicitly develops collocational awareness of EFL learners. The qualitative data extracted from the study revealed that upper-intermediate level learners developed an awareness regarding lexical collocations in that they could identify and categorize them in any discourse. Moreover, the quantitative data in Koç's study showed that teaching collocations explicitly enhanced vocabulary retention of the learners. As far as the research concerning the use of collocations in certain contexts, Bıçkı (2012) and Ördem (2013) investigated certain uses of collocations in academic writing. Particularly, Bıçkı (2012) aimed to find out prevalent mistakes made by Turkish advanced level EFL learners in their academic writing. The author was particularly interested in verb+noun collocations in order to see any potential effect of the native language on the elements of that specific collocation type. Corpus data drawn from the study revealed that the learners had difficulty in semi-restricted collocations. More importantly, the verb constituents in the verb+noun collocations were argued to be challenging for the learners. Along the same vein with Bıçkı (2012), Ördem (2013) aimed to investigate verb+noun collocations across different genres of academic writing (*internationally recognized articles in the fields of health, physical, and social sciences*). The author was particularly interested in the similarities and differences of verbs and their collocations. The corpus specifically compiled for the study demonstrated that the verbs used in three genres were similar although the nouns they attracted showed variation. At the end of the study, he concludes that advanced level EFL/ESL learners can mind the conventions employed in the academic genre in order to accomplish their goals in the academic world. The study by Demir (2017) stands out from Bıçkı (2012) and Ördem (2013) in that the author compared academic writing of native and non-native speakers while paying attention to various types of lexical collocations. The analyses of the corpora composed of research articles written by Anglophonic and Turkish authors demonstrated that native speakers used more lexical collocations except for the noun+verb category. Elsewhere, Vural (2010) also investigated verb+noun collocations although he did not employ a corpus in particular. Instead, he conducted an experimental study in order to

measure the effect of teaching verb+noun collocations in three different conditions. The results were in congruence with Bağcı (2014) in that explicit teaching condition was found to be more effective than the other conditions in terms of the participants' test scores. In another experimental study, Balcı and Çakır (2012) aimed to investigate to what extent teaching vocabulary by making use of collocations is effective. The participants of the study were 59 EFL learners of English who studied in the seventh grade at their schools. The results were in harmony with the previous studies described above. That is to say, the participants in the experiment group were more successful than the participants in the control group who were taught vocabulary with classical techniques (e.g. *antonyms, synonyms, translations, definitions*). Elsewhere, Akkoyunlu (2017) aimed to raise awareness towards lexical collocations among prospective English teachers. To this end, she developed a program in which data-driven learning and teaching procedures were employed in a translation course at Çukurova University. In the study, there was a single group whose performance in terms of using verb+noun lexical collocations was evaluated through pre and post-tests. The results after the Wilcoxon Signed Rank test showed that there was a significant difference regarding the performance of the undergraduate ELT students after being taught through data-driven learning approaches. In another study, Mutlu (2015) dealt with the perceptions of Turkish EFL learners and teachers as regards the place and teaching collocations in Turkish context. The analysis of the student questionnaire conducted with 326 fourth grade learners in the study indicated that the learners acknowledged collocations to have value in language learning although the allocated time for teaching collocations was deemed to be insufficient. In addition, the learners considered that their collocational mistakes were primarily due to the influence of the native language. The teacher questionnaire, on the other hand, revealed that the teachers devoted considerable time to teach frequently used collocations. In addition, they also recognized the fact that collocational mistakes of the learners stemmed from Turkish.

The studies described above indicate that research concerning collocations and teaching collocations in Turkey fails to comply with the psychological reality of collocations. That is to say, while there is a good deal of research dealing with raising awareness towards collocations and teaching effectively by benefiting from them, it seems there is a shortage of research on how collocational knowledge is represented in the mental lexicon. Bearing this in mind, there are only two studies approaching the phenomenon of collocations from psycholinguistic viewpoint in Turkish context. In one of those studies, Cangır et al. (2017) investigated collocational priming with the incentive that there was a complete lack of research on how collocations are primed in the Turkish language. The authors were also interested in the role of frequency and part of speech affecting collocational priming. The study was carried out with 41 native speakers of Turkish with the assist of an LDT. The items in the study included 60 adjective+noun and verb+noun collocations in total. The results of the study revealed that native speakers of Turkish process verb+noun collocations faster than adjective+noun collocations. The study also demonstrated that frequent items are faster to be processed in the mind. The authors, therefore, deduce that frequency

and part of speech appear to have an influence on collocational priming in Turkish. In the other study, Cangır (2018) investigated the relationship between native language and second language collocational processing in the mental lexicon of bilinguals. To this end, sixty collocations with non-collocations and fillers were used in an LDT taking their frequency, semantic opaqueness, and congruence into consideration. The study revealed that collocations are primed for Turkish bilinguals whose second language is English. Furthermore, it was demonstrated that frequency is involved in processing of collocations (*Experiment 1*). It appears there is little research investigating collocational priming in Turkish context. To be more precise, there is no single study investigating how academic verb+noun collocations are primed for Turkish EFL learners. Therefore, it can be argued that the current study plays an instrumental role in the relevant literature in that it investigates collocational priming in Turkish EFL learners' mental lexicon taking the role of frequency and proficiency levels into consideration.

CHAPTER THREE

3. METHODOLOGY

3.1. Introduction

This chapter includes the research design and the tools to investigate the research questions presented at the outset of the present study. Having listed and discussed the methodological considerations, the participants, and the items, the chapter is concluded with the piloting of the experiment.

3.2. Overall Design

Priming phenomenon is acknowledged to exist when a reader or hearer reacts to the target word of a collocation faster on condition that the prime word of the collocation has been seen earlier or is semantically related. For instance, a target word such as *tea* is supposed to have a shorter reaction time when it comes after a prime word such as *coffee* as the words are semantically related (Durrant, 2008: 105-106). However, it may not yield as shorter reaction time when the word *tea* comes after a semantically unrelated word, say *phone.* As Balota (1994) states, priming phenomenon has been asserted to be seen between orthographically and phonologically similar words, between semantically related words and "between syntactically congruous words" (as cited in Durrant, 2008: 108). From this point of view, what Balota has termed as semantically related and congruous words can be argued to be collocations which occur together in language "more often than is explicable in terms of random distribution (Hoey, 2005: 5). Specifically, it can be understood from Balota's description that the author refers to collocations, the constituents of which are semantically related and congruous.

In this study, a lexical decision task (henceforth referred to as LDT) was used in order to measure collocational priming. That is, the task was employed in an experimental design to investigate whether verb+noun collocations are processed in the mental representations of Turkish EFL learners. The potential role of frequency and language proficiency level on such process was also taken into consideration. An LDT is a typical task where participants are required to categorize visual stimuli as words or non-words (Jiang, 2012: 4). In LDTs, participants are shown a single word, which is the prime word (the first collocate in a collocation), via a computer screen. At this stage, they are not required to show any overt reaction. Following the prime word, participants are

shown an item which may be a real word or a non-word. The second item is called the target word (the second collocate in a collocation). Here, participants are required to classify the target as a word or a non-word, hence the name lexical decision task. Eventually, if the target words belonging to the prime words of collocations are reacted in significantly shorter time compared to the target words of non-collocations, it is concluded that priming exists between the word pairs. That is to say, collocations are considered to be primed for those who take part in an LDT when the reaction times in response to the target words of collocations are significantly faster than the reaction times belonging to the target words of non-collocations. To illustrate, the first collocation in the current study was *draw attention*. During the LDT, the participants were first shown the prime word *draw* for a very brief amount of time. Then, they were shown the target word *attention,* which they were supposed to classify as a word or non-word in English by pressing the right and left control buttons on the keyboard. The right control button meant it was a word, whereas left control button meant it was a non-word. The same process took place for the non-collocation, which was *cause attention* in this study. That is, the participants were required to classify the target as a word or a non-word after having been shown the prime. In this fashion, the participants reacted to all the target words belonging to the collocations, non-collocations, fillers, and non-words, which will be described below in *Item Development* section, by opting whether they are words or non-words in English. The software used for the LDT recorded all the data regarding the reaction times given to the target words in each pair.

In order to investigate collocational priming in terms of academic verb+noun collocations, the LDT in the current study included collocations, non-collocations, fillers, and non-words. More precisely, each verb+noun collocation in the study (e.g. *draw attention*) was accompanied with a non-collocation (e.g. *cause attention*), a filler (e.g. *knit emphasis*), and a non-word (e.g. *obey strouche*). Bearing this in mind, the study was concerned with significant differences in terms of reaction times between the collocates and non-collocates, while reaction times in response to the fillers and non-words were ignored. In other words, providing that the participants in this study react to the collocates in significantly faster reaction times compared to non-collocates, it will be acknowledged that verb+noun collocations are found in their mental representations. The process regarding how the collocations, non-collocations, fillers, and non-words were employed in the study is explained in more detail in *Item Development.*

3.3. Methodological Considerations

The software DMDX was put into service in order to carry out the LDT. The software was launched at Monash University in collaboration with Arizona University by Forster and Forster (2003) and has been an open-source tool ever since. It is a Microsoft Windows software which was designed in order to measure reaction times in response to auditory and visual stimuli. In this sense,

it is so accurate that it can measure stimuli in milliseconds once technical requirements have been met on computers to be used for the LDT.

Before starting the LDT, the participants were thoroughly informed in preparation for the task, however, they were not briefed regarding the relationship between the word pairs in an effort to prevent them from using strategies. With respect to that, it has been asserted by scholars that automatic priming is more satisfactory in terms of reflecting mental lexicon compared to strategic priming (Frenck-Mestre, 1997: 483; Lucas, 2000: 619). Therefore, the participants were not aware of what relationship the word pairs exactly entertained during the task.

Figure 1 shows a sample of the codes used in the present study in order to trigger the software DMDX to run and present stimuli for the participants. The whole set of the codes can be seen in Appendix 1. As appears in Figure 1 and Table 3 below, upon entering their names, and completing a practice session including 6 random items, the participants were required to classify the target words in the collocations (N=34), non-collocations (N=34), fillers (N=34), and non-words (N=34) as words or non-words via DMDX. In other words, the participants made a decision whether the target word (the second collocate) in each pair was a word or non-word in milliseconds. Two breaks were available for the participants to ease their concentration on the task and prevent them getting tired. All the items were presented in a random order for each participant to avoid repetition effects which may have a negative influence on the priming process (Wolter and Yamashita, 2014: 13). As can be seen in Figure 1 and Table 3, after entering their name and completing the practice session, the participants were first shown an asterisk (*) for 250 milliseconds. After that, they were shown a mask (##########) for 500 milliseconds. Finally, they were shown the prime and target words of all the items (N=136) in a randomized fashion for 67 and 83 milliseconds, respectively. The program, DMDX, recorded all the data to be analyzed afterwards.

Figure 1: A Sample of the Codes Used in DMDX

```
$00 <ln -1> "Press SPACE for",

<ln 0> "the Real Test",

<ln 1> "Respond as fast as",

<ln 2> "you can, please!";$

+1 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "draw" / <ms% 83>/ * "ATTENTION" ;

+2 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "cause" / <ms% 83>/ * "ATTENTION" ;

+3 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "knit" / <ms% 83>/ * "EMPHASIS" ;

-250 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "obey" / <ms% 83>/ * "STROUCHE" ;

+4 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "reach" / <ms% 83>/ * "PEAK" ;

+5 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "die" / <ms% 83>/ * "PEAK" ;

+6 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "crash" / <ms% 83>/ * "ARMY" ;

-251 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "admit" / <ms% 83>/ * "CANC" ;

+7 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "gain" / <ms% 83>/ * "ACCESS" ;

+8 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "mark" / <ms% 83>/ * "ACCESS" ;

+9 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "chew" / <ms% 83>/ * "AUTHOR" ;

-252 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "blow" / <ms% 83>/ * "WHUNCH" ;
```

Table 3: An Example of the DMDX Screen Displayed for Each Participant

The Fixation Point (*) 250 milliseconds	Masking (##########) 500 milliseconds	Prime Words 67 milliseconds	Target Words 83 milliseconds	Type of Items
*	##########	draw	ATTENTION	**Collocation**
*	##########	cause	ATTENTION	**Non-Collocation**
*	##########	knit	EMPHASIS	**Filler**
*	##########	obey	STROUCHE	**Non-word**

As far as the technical issues regarding the operation of the DMDX software and the LDT such as fixation points, masks, and stimulus onset asynchrony (SOA) and how long each one of them was shown in DMDX are concerned, the recommendations put forward by Jiang (2012) were taken into account.

3.3.1. Fixation Points

Firstly, a fixation point which is usually displayed with a "*" or a "+" symbol, was opted to be shown on the screen for 250 milliseconds. According to Jiang (2012: 191), fixation points in visual LDTs help participants focus on the task at hand. From this point of view, they have been

used in several priming studies to convey the signal that the task is about the start for participants (Hodgson, 1991; Frenck-Mestre and Prince, 1997; Wolter and Gyllstad; 2011; Sonbul and Schmitt, 2012; Vilkaite and Schmitt, 2017). The fact that the fixation points were shown for 250 milliseconds in this study was built on the study conducted by Wolter and Gyllstad (2011). The fixation points in their priming experiments were shown for 250 milliseconds, and the participants were non-native speakers. Thus, it was considered that such duration could also work well with the non-native participants in this study.

3.3.2. Masking

Another methodological issue, following the fixation points, was the masking as shown in Figure 1 and Table 3. According to Jiang (2012: 104), it is widespread to use masking or masks which can be shown in the form of a set of hash marks (########) in LDTs. As to the length of masks, it is widely accepted that the number of hash marks should be equal to the longest word in the experiment. For instance, the longest word used in the present study included 10 letters, so the same quantity of hash marks was employed in the task. Regarding the use of masks, Forster and Davis (1984: 684) assert that masks used in priming experiments prevent participants from using strategies. In other words, masks ensure that participants process prime words in LDTs in a subconscious fashion. As stated above, automatic priming has been acknowledged to be more satisfactory in terms of measuring priming. Therefore, it was vital in the study that the participants would not develop strategies while processing the prime words. As far as the duration of the masks in the study is concerned, 500 milliseconds were considered to be appropriate as masks are suggested to be shown much longer than prime words, which will be explained next. In addition, Frenck and Mestre (1997: 486), who also conducted priming experiments with non-native speakers, opted to use masks shown for 500 milliseconds in their study.

3.3.3. The Duration of the Prime and Target Words

Another methodological issue in the DMDX script as shown in Figure 1 and Table 3 was how long the prime words are supposed to be shown for the participants. Here, it is worth mentioning that the stimulus onset asynchrony (SOA) was the main consideration in deciding on the duration of the prime words. SOA has been described as the duration "between the initial presentation of prime words and the presentation of target words" (Wolter and Gyllstad, 2011: 433). In this sense, Frenck and Mestre (1997: 488) suggest that SOA must be as much as 150 milliseconds to accurately measure priming. Bearing this consideration in mind, the prime words in the current study were opted to be presented for 67 milliseconds. It is because a long display such as 100 milliseconds risks making prime words apparent for participants, in such a way that they would develop strategies. A shorter display such as 25 milliseconds, however, prevents the participants to process prime words (Jiang, 2012: 42). Therefore, in light of the suggestions by Jiang (2012) and

Frenck and Mestre (1997), who presented prime words for 67 milliseconds in their study, this study allowed the prime words to be shown for 67 milliseconds as shown in Figure 1 and Table 3. Finally, since SOA, which is the duration between the onset of primes and onset of targets, was opted to be shown for 150 milliseconds to obtain a priming effect, the target words were displayed for 83 milliseconds in this study. As a result, the duration of the prime words (*67 milliseconds*) and the target words (*83 milliseconds*) constituted a 150-millisecond of SOA.

3.4. Participants and Procedure

The participants were 71 Turkish learners of English who study English Language and Literature (ELL) at Gümüşhane University in Turkey. All the participants took a placement test designed by Cambridge University Press (2010). As all the items used in the LDT of the current study were of B1 and B2 level, only those learners who were at B1 and B2 language proficiency levels as outlined Common European Framework of Reference for Languages (CEFR) took part in the study. As a result, learners at the same department but below the B1 and B2 threshold were considered to be ineligible to take part in the study. None of the participants had been to an English speaking country before. All the participants took an end of experiment questionnaire after the LDT, which included items addressing their physical states (e.g. *vision, dexterity, short term memory*) as well as the experiment itself (See Appendix 2). Those who were eligible to take part in the study took a consent form indicating that they were volunteers to contribute to the study. The form can be seen in Appendix 3.

Upon designing the DMDX script as shown in Figure 1 and Appendix 1 for the experiment, the participants were accepted in a computer lab at Gümüşhane University. There were 25 computers in the lab, and the participants were taking classes in their department at the time, so it was a demanding process to get the participants in the lab. That is, even if the participants did not have any classes at the time of the LDT, the lab was not available as it had its own schedule for other classes. Conversely, when the lab was available, the participants to take part in the LDT were busy with their classes. As a result, the experiment, hence the LDT took place in 4 different sessions due to the strains described above. Once in the lab, each participant was asked to open the DMDX software on their computer to start the LDT. The experiment took approximately 10 minutes for all participants.

After the experiment, the participants were asked to complete the end of the experiment questionnaire which included items concerning their eyesight, dominant hand, and other biographical information which was considered to be potentially fruitful for the findings of the study. In particular, they were asked in their native language whether they had any short term memory problems, whether they were able to see the target words which they were required to classify as word or non-words, and whether they were able to see the prime words flashing briefly

before them. It was important that they processed the prime words in a subconscious way, for it needed to be an automatic process to obtain priming effect. The results of the LDT, which is basically the mean reaction times of the targets in the collocations and non-collocations were analyzed with the exploitation of Jamovi (The Jamovi Project, 2019, https://www.jamovi.org/) and other DMDX tools such as UnloadAZK and Analyze software (Forster and Forster, 2003).

3.5. Item Development

The items used in the study were utilized in accordance with the guidelines of the frequency-based approach discussed in the previous chapter. That is, all the collocations employed in the LDT were above 2.0 t-score and 3.0 MI score to ensure that the items have been encountered by the participants before. With respect to that, Fernandez and Schmitt (2015: 96) assert that t-score and MI score are among the widely used frequency measurements to identify collocations. From this point of view, t-score reveals frequently used collocations. MI score, on the other hand, does not necessarily identify highly frequent collocations, but it brings out strongly linked collocations such as *commit crime*. That is, there is a lower probability that *commit* occurs with another word than *crime* or vice versa. According to the authors, there is no consensus on which of these measurements or any other is safe to use in research, yet minimum 2.0 t-score and 3.0 MI score are considered to be safe limits to ascertain that the word pair at hand is a genuine collocation (Hunston, 2002: 71-72; Schmitt, 2010: 131).

It was discussed earlier that EFL learners in Turkey who study at ELT and ELL departments of universities do not seem to meet the standards of the academic world and that there is a quality problem in terms of their language use. The learners attempt to generate language from scratch by using "individual bricks" (Kjellmer, 1991: 124) rather than applying the idiom principle as introduced by Sinclair (1991: 79-110). In this sense, the use of collocations by the learners prevent them from using non-native-like language and gain a lot in their endeavor to be proficient in the second language (Siyanova and Schmitt, 2008; Barfield and Gyllstad, 2009; Fernandez and Schmitt, 2015). In light of the fact that collocations are useful and advantageous for EFL learners, the current study aims to investigate whether academic verb+noun collocations are mentally processed or primed in Turkish EFL learners. It is because priming phenomenon is the reason why there are collocations in language (Hoey, 2005: 3-5). Specifically, Hoey suggests that words are entrenched in language users' mental lexicon with their contexts and particular other words with which they co-occur via linguistic input. As a result, every word in language is primed to occur with another word, which is called collocational priming. Regarding that, Durrant (2008) argues that collocations hold a priming effect for native speakers. In order to find out whether collocations are primed in Turkish EFL learners, which is the main aim of the current study, the verb+noun collocations in Pearson International Corpus of Academic English (PICAE) described by Ackermann and Chen (2013) were utilized. According to the authors, the academic collocation list

(ACL) which was developed in accordance with PICAE consists of more than 25 million words. Within this context, they present a new collocation list based on reliable corpus statistics and expert judgment, which ultimately proves to consist of 2,468 most frequently used academic collocations. The authors are of the opinion that the list can enhance learners' collocational competence and increase their proficiency levels. Relying on the validity of the list, the current study utilized the verb+noun collocations (N=310). As was discussed above, verb+noun collocations were under the scope as they are the most frequent and important type of collocations and pose great difficulty for learners (Nesselhauf 2005: 9), and that they are problematic considering Turkish EFL learners (Bıçkı, 2012: 85). In addition, the collocations, which were extracted from ACL, were more likely to take place in the academic genre as the participants of the study were assumed to be unable to follow the requirements of academic contexts.

In order to determine the items to be used in the LDT, only those collocations which enjoy a minimum 2.0 t-score and 3.0 MI score were chosen due to the reasons pointed out above. Then, cognates (e.g. *role, goal, method*), which are also found in the native language of the participants, were eliminated from the list. The assumption behind the redundancy of the cognates was that they are considered to attain a stronger priming effect than non-cognates (De Groot and Nas, 1991: 106). Since it was not the aim of the present study to investigate priming effect in cognates, they were not exploited in the study. The total number of the items after the elimination of the cognates was 164. Afterwards, recurrent elements in either of the collocates were also left out. For example, elements such as *achieve*, *become*, and *consider* take place more than once in the list, so only one sample from those recurrent elements were included in the LDT. The total number of the collocations at this point was 64. Finally, taking the English proficiency levels of the participants into consideration, collocations under B1 and above B2 levels were also excluded from the list. The decision regarding the level of the collocations was made in accordance with the English Vocabulary Profile (2012, http://vocabulary.englishprofile.org/staticfiles/about.html) which suggests the words learners know at each level of CEFR. Finally, there were 34 collocations to be used in the LDT.

3.5.1. The Items Employed in the Study

Having established the collocations to be used in the study, a non-collocation, a filler, and a non-word were required to be assigned for each collocation. Such methodology which has been used in several studies is widespread in priming research (De Groot and Nas, 1991; Durrant, 2008; Wolter and Gyllstad, 2011; Wolter and Yamashita, 2014; Sonbul and Schmitt, 2012; Cangır et al., 2017; Cangır, 2018).

In order to assign a non-collocation for each collocation, raw frequency of the prime word in each collocation occurring in The British National Corpus (BNC), which is a -100 million-word

representative corpus of spoken and written English, was taken into consideration (What Is British National Corpus, (n.d.), https://www.sketchengine.eu/british-national-corpus/). In order to determine raw frequencies of the prime words, Sketch Engine, which is a web-site allowing numerous facilities for corpus studies, was utilized (What Is Sketch Engine, (n.d.), https://www.sketchengine.eu/#blue). To illustrate, the first collocation used in the study was *draw attention*, whose prime word (*draw*) has a raw frequency of 21,579 - 192.08 per million in the BNC. Taking that frequency measure of the prime word into consideration, another prime word which has a similar word length, word level (B1-B2), and frequency was extracted from the BNC, which was *cause* having a raw frequency measure of 20,030 - 178.29 per million. Therefore, the non-collocation assigned for *draw attention* was *cause attention* in the study. Eventually, all of the collocations (N=34) were assigned with non-collocations. With a simple t-test it was ensured there was no significant difference between all the collocations and non-collocations in terms of their raw frequency. Assigning non-collocations for all the collocations in the study was crucial since the reaction times in response to the target words of the collocations and non-collocations were measured to reach a conclusion in terms of collocational priming.

Secondly, each collocation in the study was allocated a filler word. The only reason to use filler words in the study was to prevent the participants from developing strategies in the LDT. As the raw frequency of the filler words were not taken into account in the data analysis, the only criteria to establish the list of the filler words were the word level and word length. For example, *draw attention* was assigned with *knit emphasis* as a filler, whose prime and target words were similar to the collocation at hand regarding word length and level. As a result of such consideration, there were 34 filler words to be used in the study.

Finally, all of the collocations in the study were assigned with non-word collocates (targets), which are not found in the English language. As in the case of the filler words, the non-words were not taken into account for the analysis. The only reason why non-words were employed in the study was to prevent the participants from developing strategies. Since the participants were required to react to the target words in all sets, only the target words were shown as non-words in the LDT. The non-words were extracted from a list created with the utilization of ARC Non-Word Database (ARC Non-Word Database, 2015, http://www.cogsci.mq.edu.au/research/resources/ nwdb/nwdb.html). All the non-words in the study were orthographically similar to the words in the English language. They were also similar to the collocations in terms of length and level. For example, the non-word assigned for *draw attention* was *obey strouche*, whose prime word has a similar length and level, and the target word (non-word) is orthographically appropriate for the English language.

In light of such procedure described above, there were 136 word pairs to be used in the study (See Appendix 4). Table 4 below shows a sample of the items used in the study. The collocates and

non-collocates all have similar raw frequencies in the BNC, which a simple t-test demonstrated that there are no significant differences regarding their frequency. The fillers and non-words, which were not analyzed in the study, are similar to the collocations in terms of word level and length.

Table 4: A Sample of the Items Used in the LDT

	Collocation	**Non-Collocation**	**Filler**	**Non-Word**
BNC Data	draw attention	cause attention	knit emphasis	obey strouche
Freq. of the Node	21,579 192.08 per million	20,030 178.29 per million	-	-
t-score	32.54	-	-	-
MI score	8.67	-	-	-

3.6. Piloting

As far as the piloting of the experiment is concerned, 13 EFL students (4 male and 9 female) who study at the preparatory school at the same university and did not take part in the actual study were accepted in the lab to complete the LDT. The proficiency levels of the piloting students ranged from B1 and B2 of CEFR, which was determined in accordance with the placement test used in the study. The pilot experiment revealed that certain items had high error rates. That is to say, the participants taking part in the pilot experiment were not able to classify certain target words as words or non-words, which led to high error rates. Since reaction times between the collocates and non-collocates rather than erroneous items were essential for the analysis, the items with high error rates were updated for the actual LDT. Upon establishing that the LDT and the questionnaires did not present any difficulties for the participants or technical problems, the actual experiment was conducted with the actual participants of the study.

4. FINDINGS AND DISCUSSION

4.1. Introduction

This chapter includes the findings of the questionnaire used in the current study. The questionnaire included items regarding vision, dexterity, and short term memory of the participants, which may influence the priming process. The findings regarding whether academic verb+noun collocations are primed in Turkish EFL learners are presented in *The Results of the Lexical Decision Task*. Later, the influence of frequency and language proficiency in the process is provided in *Mixed Effect Modeling Analysis Regarding Frequency and Proficiency* section. Finally, the findings are discussed taking the second language and vocabulary acquisition as well as the relevant literature into consideration.

4.2. The Results of the End of Experiment Questionnaire

The results of the end of experiment questionnaire (See Appendix 2) dealing with the vision, dexterity, and short term memory of the participants revealed that all of the participants except 2 had not experienced any problems regarding their short term memory in their lives (See the 6th item on the questionnaire). Regarding that, holding a sound short term memory is crucial in priming experiments as prime words are shown for a very brief amount of time for participants, and problematic short term memory may have a negative impact on priming process (Cangır, 2018: 84). In light of such fact, the 2 participants who stated that they had experienced short term memory problems were asked to complete a simple digit span test on a separate session (Digit Span Memory Test, 2019, https://www.memorylosstest.com/digit-span/?011618). According to Miller (1956: 8), working short term memory is acknowledged to be capable of recalling between 5 and 9 items. During the digit span test, therefore, the 2 participants were asked if they could recall 6 digits they were shown. Ensuring that the participants were able to retain the 6 digits from their short term memory on the test, it was concluded that their performance on the LDT was worth analyzing.

As far as the vision of the participants is concerned, none of the participants except 4 stated problems regarding their eyesight. Among those 4 participants, only the performance of 1 participant was not taken into account during the analysis as she stated that she was not able to see

the prime and target words during the LDT. In contrast, since the other 3 participants with eyesight problems stated that they managed to spot the prime and target words during the LDT, their performance was taken into account for analysis (See the 8th and 9th items on the questionnaire).

With respect to the dexterity of the participants, 63 of them were right-handed, whereas 4 were left-handed. In addition, 4 of the participants stated that they were capable of using both hands. The information regarding participants' dominant hand was considered to be necessary as it may come handy in analyzing potentially offbeat reaction times and/or high error rates. Table 5 shows all the relevant information regarding the participants' biographical information.

**Table 5: The Results of End of Experiment Questionnaire Regarding the Participants'
Biographical Information**

Participants	Gender	Dexterity	Vision	Short-term Memory
Turkish EFL Learners (*N=71*)	58 Female 13 Male	63 Right-handed 4 Left-handed 4 Both-handed	1 had problems with their eyesight	None had problems with their short-term memory

The 8th and 9th items on the end of experiment questionnaire were related to the prime words (the first collocate in the collocations) and the target words (the second collocate in the collocations) in the LDT. In this sense, the participants were asked whether they were able to see those words consciously. For the purposes of the study, the participants were supposed to see the prime words subconsciously to prevent them from developing strategies during the experiment. As discussed above, automatic priming rather than strategic priming is an acceptable indicator of the mental lexicon (Frenck-Mestre, 1997: 483; Lucas, 2000: 619). Thus, the 9th item on the questionnaire, which was translated into the native language of the participants, asked *"Were you able to spot the words momentarily appearing (flashing briefly) on the screen during the experiment?"* Figure 2 shows the item regarding the prime words on the questionnaire.

Figure 2: The Item Regarding the Prime Words on the Questionnaire

Taking all of the participants into consideration, the 9th item on the end of experiment questionnaire revealed that 14,08% of the participants were able to spot all of the prime words, 33,8% of them were able to detect almost all of the prime words, 32,9% of them were able to recognize some of the prime words, and 19,22% of them were not able to see any of the prime words. As discussed earlier, it was expected in the current study that the participants processed the prime words subconsciously. Although the end of experiment questionnaire demonstrated that almost half of the participants claimed that they were able to consciously see the prime words, it was assumed in the present study that the participants did not use strategies in the LDT. That is to say, they were not aware of the fact that their collocational knowledge was being measured. It is because the prime words were only shown for 67 milliseconds for the participants, which was an ideal duration for the experiment (See *Methodological Considerations* for a detailed discussion).

Similarly, in order to confirm whether the participants were able to spot the target words in the LDT, the 8th item on the questionnaire, which was also asked in the native language of the participants, was *"Did you find it difficult to read the words that appeared on the screen for a long time during the experiment?"*. Figure 3 below shows the item regarding the target words on the questionnaire.

Figure 3: The Item Regarding the Target Words on the Questionnaire

8. Deney sırasında ekranda uzunca bir süre görünen, cevap vermeniz gereken kelimeleri okumakta zorlandınız mı?

☐ Evet
☐ Hayır

Unlike the prime words, the target words did not need to be detected in a subconscious fashion by the participants since they had to make a decision to determine whether they were words or non-words. With respect to that, 87,32% of the participants stated that they had no difficulty in spotting the target words, which indicates that most of the participants were aware of the target words they were supposed to react.

After the completion of the LDT and the end of the experiment questionnaire, the participants were interviewed in an attempt to see whether they were aware of what was being measured during the LDT. The aim of the interview was simply to make sure that the participants did not use any strategies. The interviews conducted in four different sessions with different participants demonstrated that the participants did not develop strategies during the LDT, therefore, automatic priming rather than strategic priming as it had been expected, was considered to be measured in the LDT. It is worth noting at this point that the participants who claimed they were able to consciously

see the prime words in the LDT may have actually meant the target words. That is to say, the participants may have confused the prime words and target words as they lack such technical knowledge of telling the prime words from the target words. As a result, it was concluded that the participants did not use strategies in the LDT, and the reaction times of all the participants except one, who stated that she had eyesight problems and did not see the target words, were taken into consideration for the analysis.

4.3. The Results of the Lexical Decision Task

The number of the participants who were involved in the LDT was 71, but one of the participants with eyesight problems who claimed that she did not detect the target words was considered to be ineligible for the analysis. Therefore, the performance of 70 participants in the LDT was scrutinized for the analysis of the study. Furthermore, only the reaction times between 200 and 2500 milliseconds were taken into account for the analysis, and the erroneous reactions were ignored. That is to say, the reaction times slower than 2500 milliseconds and faster than 200 milliseconds were not found worthy of analysis in accordance with the guidelines of priming research suggested by Jiang (2012: 70). As far as extraordinary reaction times are concerned, Jiang states that faster reaction times (e.g. below 300 milliseconds) should be considered invalid as it is not likely that participants react to stimuli in such a short time. On the other hand, slower reaction times (e.g. above 2500 milliseconds) may indicate that there is something unusual going on, for instance, participants may be using strategies. In short, reaction times which do not fit the prescribed cut-off points may indicate that participants do not pay attention to the experiment or they are simply tired. Regarding that, Cangır et al. (2017) and Cangır (2018) also specified certain low and high cut-off reaction times in their study in order to avoid extraordinary data. As a result, in this study, only those reaction times between 200 and 2500 milliseconds were taken into consideration for the analysis.

In order to prepare the data for the analysis, all the data regarding the participants and the items were supposed to be automatically extracted from the DMDX software by-products. However, due to the technical problems encountered, the process had to be completed manually. That is, the reaction times of all the collocates and non-collocates (N=68) for all the participants (N=70) were entered manually in a time-consuming and challenging process. As discussed earlier, the reaction times in response to the fillers and non-words as shown in Table 4 and Appendix 4 in more detail were not taken into account for the analysis in the current study. Table 6 below shows the data regarding the first participant of the study after the completion of the LDT. Accordingly, taking the other participants into consideration, and eliminating the extraordinary reaction times and erroneous items, there were a total of 4587 observations to be analyzed.

As can be seen in Table 6 below, the first participant in the present study (*Subject 1*) had a proficiency level of B1, which was determined in light of the placement test and the guidelines of CEFR. In the fourth column, it can be seen that the participant reacted to all the items accurately. That is, the participant was able to classify all the target words in each collocation and non-collocation as a word or non-word. However, it appears that the participant reacted to the 39th item in the LDT under 250 milliseconds, which was not taken into account for the analysis due to the reasons discussed above. The fifth column demonstrates how long it took the participant to react to the target words for each collocation and non-collocation, and the sixth column shows information regarding collocations (1.0) and non-collocations (-1.0). To illustrate, as far as the first item, which is a collocation, is concerned, the participant reacted to the target word (*attention*) following the prime (*draw*) in 711.11 milliseconds. However, the same participant reacted to the target word (*attention*) following the prime word (*cause*) of the second item, which is a non-collocation, in 349.20 milliseconds. The rest of the columns on the very right-hand side of the table are related to the frequency of the items, which was extracted from the BNC. Obviously, the non-collocations have zero values in terms of collocation count, and minus values regarding the t-score and MI score.

Table 6: The LDT Data Regarding the First Participant of the Study

| Subject	CEFR Level	Placement Test Score	Item	RT	Coll. Status	Collocation Count	t-score	MI Score	Prime Word Frequency	Target Word Frequency
s1	B1	64	w1	711.77	1.0	1.475	38.34	9.14	21.579	13.585
s1	B1	64	w2	349.20	-1.0	0	-89.47	-11.46	20.030	13.585
s1	B1	64	w3	264.10	1.0	230	15.12	8.31	22.446	3.261
s1	B1	64	w4	1238.15	-1.0	0	-23.46	-9.53	21.909	3.261
s1	B1	64	w5	1019.63	1.0	337	18.31	8.71	8.406	10.180
s1	B1	64	w6	492.30	-1.0	0	-26.09	-9.69	7.802	10.180
s1	B1	64	w7	671.90	1.0	99	9.91	7.83	6.379	7.554
s1	B1	64	w8	402.39	-1.0	0	-13.26	-8.71	5.353	7.554
s1	B1	64	w9	265.75	1.0	358	18.89	9.11	5.357	13.585
s1	B1	64	w10	470.36	-1.0	0	-22.36	-9.46	5.013	13.585
s1	B1	64	w11	546.67	1.0	320	17.81	7.93	16.725	7.420
s1	B1	64	w12	673.81	-1.0	0	-43.81	-10.43	17.964	7.420
s1	B1	64	w13	925.67	1.0	64	7.96	7.71	2.642	12.992
s1	B1	64	w14	775.79	-1.0	0	-23.53	-9.54	5.514	12.992
s1	B1	64	w15	420.97	1.0	115	10.66	7.34	7.446	10.180
s1	B1	64	w16	416.76	-1.0	0	-28.85	-9.83	8.625	10.180
s1	B1	64	w17	589.67	1.0	176	13.19	7.52	8.882	12.605
s1	B1	64	w18	569.49	-1.0	0	-33.61	-10.05	8.116	12.605
s1	B1	64	w19	443.54	1.0	91	9.44	6.64	12.426	9.333
s1	B1	64	w20	513.79	-1.0	0	-44.82	-10.47	14.611	9.333
s1	B1	64	w21	513.79	1.0	95	9.67	6.90	20.320	11.959
s1	B1	64	w22	1745.31	-1.0	0	-75.36	-11.21	19.166	11.959
s1	B1	64	w23	538.68	1.0	27	5.14	6.50	21.419	4.805

Table 6: (Continue)

Subject	CEFR Level	Placement Test Score	Item	RT	Coll. Status	Collocation Count	t-score	MI Score	Prime Word Frequency	Target Word Frequency
s1	B1	64	w24	469.32	-1.0	0	-32.49	-10.00	20.577	4.805
s1	B1	64	w25	492.46	1.0	252	15.69	6.42	20.117	38.111
s1	B1	64	w26	491.32	-1.0	0	-213.18	-12.71	17.008	38.111
s1	B1	64	w27	461.87	1.0	86	9.16	6.40	5.025	26.723
s1	B1	64	w28	584.80	-1.0	0	-54.93	-10.76	6.253	26.723
s1	B1	64	w29	467.90	1.0	45	6.60	5.90	28.032	10.599
s1	B1	64	w30	451.91	-1.0	0	-104.31	-11.68	29.928	10.599
s1	B1	64	w31	252.70	1.0	113	10.41	5.61	12.173	36.961
s1	B1	64	w32	497.02	-1.0	0	-161.88	-12.32	13.318	36.961
s1	B1	64	w33	414.80	1.0	132	11.11	4.92	16.690	10.300
s1	B1	64	w34	564.12	-1.0	0	-48.91	-10.59	14.448	10.300
s1	B1	64	w35	616.30	1.0	712	25.99	5.28	173.646	11.959
s1	B1	64	w36	275.00	-1.0	0	-727.22	-14.48	184.872	11.959
s1	B1	64	w37	493.90	1.0	93	9.52	6.26	27.712	15.685
s1	B1	64	w38	407.43	-1.0	0	-136.87	-12.07	26.535	15.685
s1	B1	64	w39	110.39	1.0	70	8.14	5.22	8.872	17.264
s1	B1	64	w40	279.05	-1.0	0	-511.04	-13.98	8.997	17.264
s1	B1	64	w41	640.89	1.0	39	6.13	5.78	209.867	8.876
s1	B1	64	w42	549.28	-1.0	0	-608.31	-14.23	208.360	8.876
s1	B1	64	w43	380.43	1.0	158	12.14	4.87	66.112	4.181
s1	B1	64	w44	768.53	-1.0	0	-90.67	-11.48	65.955	4.181
s1	B1	64	w45	493.94	1.0	113	10.45	5.86	16.886	12.992
s1	B1	64	w46	493.94	-1.0	0	-66.04	-11.02	15.462	12.992
s1	B1	64	w47	518.15	1.0	198	14.02	8.05	6.487	12.992
s1	B1	64	w48	352.51	-1.0	0	-27.01	-9.74	6.329	12.992
s1	B1	64	w49	448.80	1.0	180	13.18	5.81	33.551	10.180
s1	B1	64	w50	366.19	-1.0	0	-101.27	-11.64	30.253	10.180
s1	B1	64	w51	559.12	1.0	15	3.76	5.78	58.483	5.794
s1	B1	64	w52	923.48	-1.0	0	-113.59	-11.81	59.618	5.794
s1	B1	64	w53	572.06	1.0	82	8.89	5.77	129.248	21.182
s1	B1	64	w54	379.11	-1.0	0	-1021.56	-14.97	146.620	21.182
s1	B1	64	w55	1020.40	1.0	9	2.85	4.30	124.366	12.365
s1	B1	64	w56	416.14	-1.0	0	-427.02	-13.72	104.995	12.365
s1	B1	64	w57	508.17	1.0	78	8.41	4.39	29.284	14.397
s1	B1	64	w58	515.01	-1.0	0	-141.11	-12.12	29.805	14.397
s1	B1	64	w59	394.30	1.0	92	9.13	4.39	19.610	57.981
s1	B1	64	w60	604.15	-1.0	0	-311.17	-13.26	16.317	57.981
s1	B1	64	w61	540.67	1.0	16	3.75	4.87	27.227	12.015
s1	B1	64	w62	586.09	-1.0	0	-121.46	-11.90	30.740	12.015
s1	B1	64	w63	501.35	1.0	62	7.63	5.02	17.936	12.015
s1	B1	64	w64	369.10	-1.0	0	-56.07	-10.79	14.197	12.015
s1	B1	64	w65	208.39	1.0	69	7.98	4.66	14.391	21.182
s1	B1	64	w66	434.74	-1.0	0	-100.01	-11.62	14.358	21.182
s1	B1	64	w67	501.58	1.0	44	6.41	4.90	4.766	27.084
s1	B1	64	w68	465.82	-1.0	0	-0.0005	-0.02	3.610	27.084

As far as the descriptive findings of the LDT are concerned, Graphic 1 and Table 7 show the results of the LDT in which mean reaction times in response to the target words of the collocations and non-collocations are presented. In addition, Table 7 displays how long it took the participants to react to the target words in collocations and non-collocations in each academic verb+noun collocation pair in terms of mean reaction times.

Graphic 1: Mean Reaction Times Regarding the Collocates and Non-Collocates
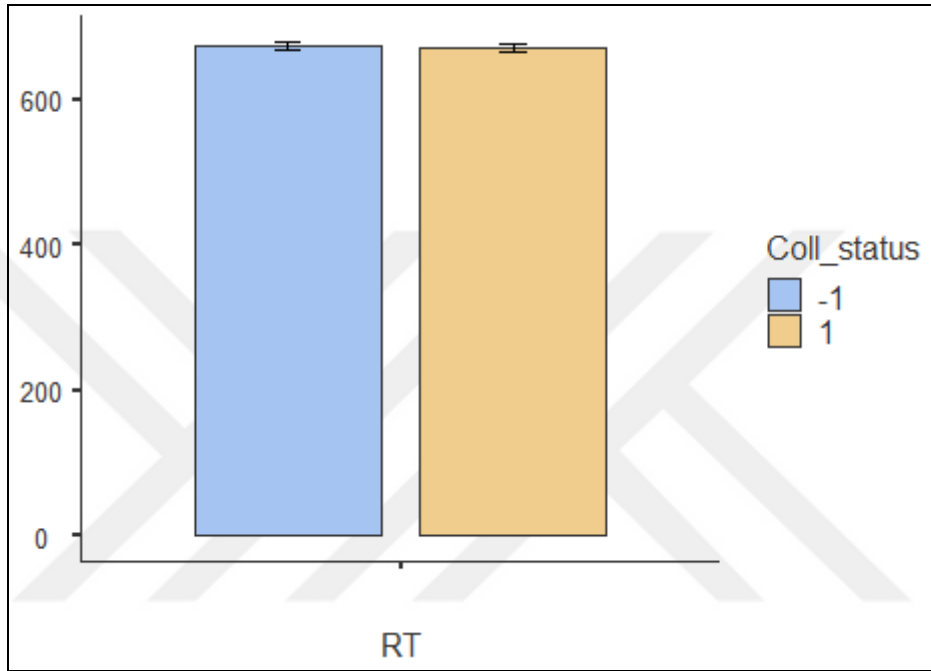
Table 7: Descriptive Findings of the LDT

Descriptives	Col. Status	Reaction Times
Missing	-1	0
	1	0
Mean	-1	674
	1	671
Standard Deviation	-1	275
	1	277
Minimum	-1	223
	1	203
Maximum	-1	1991
	1	2142

The first row of Table 7 shows that there were not any missing observations regarding the items that the participants classified as words or non-words. More precisely, all of the reaction times in response to the target words of the collocations (1) and non-collocations (-1) except for offbeat and erroneous ones are included in the analysis. Moreover, based on the mean reaction

times shown in the second row, it is apparent that the reaction times in terms of the collocates and non-collocates are at close quarters. In fact, as can be seen in Table 8 below, the independent sample t-test revealed that there was no significant difference between the collocates and non-collocates in this study ($p=0.744>0.05$). That is to say, the prime words did not facilitate a priming effect for the targets in both collocations and non-collocations indicating that academic verb-noun collocations were not mentally represented in Turkish EFL learners. Such finding conforms to the researcher's assumption in *Chapter One,* in which it is postulated that academic verb+noun collocations may not be primed in Turkish EFL learners. Finally, it can be seen from the bottom rows of Table 7 that the observations were not spread out to a certain degree both in the collocations and non-collocations based on the rather low value of standard deviation (277 in the collocations, and 275 in the non-collocations). In addition to that, it can be observed from the table that the minimum reaction times to the collocates and non-collocates were 203 and 223 milliseconds, whereas maximum reaction times belonging to the items were 2142 and 1991 milliseconds.

Table 8: Independent Samples T-Test Results

Independent Samples T-Test							
		statistic	**df**	**p**	**Mean difference**	**SE difference**	**Cohen's d**
RT	Student's t	0.326	4584	0.744	2.66	8.15	0.00964

As noted in *Overall Design*, priming phenomenon is recognized to take place in mental lexicon as long as individuals react to target words of collocations in a significantly faster fashion compared to target words of non-collocations. As far as collocational knowledge and mental representations of collocations are concerned, it has been mentioned earlier that reaction times in response to target words of collocations and non-collocations are scrutinized in priming research in order to observe a priming effect between word pairs as well as in the mental lexicon of language users. From this point of view, the current study compared the reaction times of the target words belonging to the collocations (N=34) and non-collocations (N=34) delivered by 70 participants who study English Language and Literature at Gümüşhane University. With respect to that, the independent samples t-test, as shown in Table 8 above, demonstrated that there is not a significant difference between the collocates and non-collocates ($p=0.744>0.05$). That is to say, the participants in the study did not react to the collocates faster than the non-collocates. As stated above, this insignificant difference between the reaction times belonging to the collocates and non-collocates is in line with the researcher's initial postulation, suggesting that academic verb+noun collocations are not primed in Turkish EFL learners.

4.3.1. Mixed Effect Modeling Analysis Regarding Frequency and Proficiency

Having established that academic verb+noun collocations do not constitute a priming effect in Turkish EFL learners' mental lexicon (see Graphic 1 and Tables 7-8), a mixed effect modeling analysis was implemented so as to answer the second and third research questions. To be more precise, mixed effect modeling analysis, which has been argued to provide robust analysis results in connection with second language acquisition data (Cunnings, 2012: 369), was employed in order to determine what role frequency of the academic verb+noun collocations and proficiency levels of the learners play in the process.

As regards the second language acquisition and psycholinguistics research (i.e. the current study), mixed effect modeling analyses appear to entertain certain benefits for the researcher. First of all, the facility of fixed effects in mixed effect modeling analyses can enable the researcher to test multiple independent variables at a time whether they retain nominal or quantitative data. For instance, the fixed effects in the current study included t-score and MI score of the collocations and non-collocations as well as prime and target frequencies of those items as continuous, hence quantitative independent variables. Moreover, it also included the proficiency levels of the participants in accordance with the guidelines of CEFR as independent nominal variables. The second advantage of mixed effect modeling analyses lies in the fact that it can compensate missing data in reaction time studies. As stated in *The Results of the Lexical Decision Task* section*,* reaction times slower than 2500 milliseconds and faster than 200 milliseconds were removed in the analysis in an attempt to avoid skewed data. In addition, erroneous reactions to the collocates and non-collocates were ignored. With respect to that, mixed effect modeling allows the analysis to be true by supposing that the data are missing by chance (Cunnings, 2012: 372). Finally, it was considered to be beneficial to carry out mixed effect modeling analysis in this study as it enabled the researcher to choose the subjects and items as random effects while including fixed effects in the same model. From this point of view, Carson and Beeson (2013: 27) claim that incorporating participants and items employed in LDTs as random effects in psycholinguistics research analysis is a necessity, as it allows the results to be rather true, and generalizable to the population. Therefore, based on the mixed effect modeling analysis, it can be boldly stated that the results of the current study regarding the second and the third research questions, which are presented below, are more accurate and generalizable than would otherwise be with traditional analysis models such as ANOVA (see Carson and Beeson, 2013 for a detailed account of mixed effect modeling in psycholinguistics research).

Having mentioned the potential advantages of mixed effect modeling analysis, the second and third research questions of the current study sought what role the frequency of the items and proficiency levels of the participants played on the priming process. It is worth iterating that the research presented in *Studies Investigating Collocational Priming* section has not been able to draw

strong connections between the frequency data of a corpus and how collocations are processed in the mental lexicon of non-native speakers. Therefore, the findings of this study regarding the second and third research questions, which are provided below, are of value in that they are likely to unearth certain implications regarding how academic verb+noun collocations are processed in Turkish EFL learners. In addition, it has been suggested that the first language of learners appears to have a negative effect on advanced learners in terms of collocational knowledge (Nesselhauf, 2003: 237). In this sense, the findings of the present study attempted to demonstrate the influence of proficiency on priming process of academic verb+noun collocations in the Turkish EFL learners' mental lexicon.

Table 9: A General View of the Mixed Effect Modeling of the Current Study

Estimate	Linear mixed model fit by REML
Call	RT ~ 1 + CEFR Level + t-score + MI_score + Prime Word Freq. + Target Word Freq.+(1 | Item)+(1 | Subject)
AIC	63400.0615
BIC	63444.0231
R-squared Marginal	0.0145
R-squared Conditional	0.2956

Table 9 shows a general view of the mixed effect modeling analysis carried out to see the effect of frequency and proficiency on collocational processing in the participants. As can be seen from the table, reaction times (RT) were taken as the dependent variable, whereas proficiency level (CEFR Level), t-score, MI score, prime word frequency, and target word frequency were considered as dependent variables. In addition, it needs to be noted that the items and the subjects of the study were taken into account as random effects. As mentioned above, mixed effect modeling analyses allow researchers to simultaneously include random and fixed effects in the same model, which enables the results to be more accurate and generalizable compared to conventional analysis methods. In this sense, as shown in Table 9, proficiency level, t-score, MI score, prime word frequency, and target word frequency were fixed effects, while the items and subjects were random effects in the model. The R-squared marginal value on the table shows the variance in the dependent variable explained by the fixed effects. In light of this, the fixed effects in the model explain 1.45% of the total variance in the dependent variable. The R-squared conditional value, on the other hand, is acknowledged to demonstrate the variance in the dependent variable explained not only by the fixed effects but also by the random effects. With respect to that, proficiency, t-score, MI score, prime word frequency, and target frequency as fixed effects on the one hand, and the items besides the subjects as random effects on the other, explain 29.56% of the total variance in the dependent variable.

Based on Table 10 given below, the results of the mixed effect modeling demonstrated that proficiency (p=0.646>0.05), t-score (p=0.212>0.05), MI score (p=0.347>0.05), and target word frequency (p=0.416>0.05) did not exhibit a significant effect on the dependent variable. However, the results showed that prime word frequency (p<0.001) had a significant effect on the dependent variable. In other words, among the independent variables shown in Table 10, only the prime word frequency appeared to have a significant effect on the reaction times to the collocates and non-collocates.

Table 10: Mixed Effect Modeling Results

Fixed Effect Omnibus tests				
	F	**Num df**	**Den df**	**p**
CEFR Level	0.213	1	67.8	0.646
t-score	1.591	1	62.6	0.212
MI_score	0.899	1	62.9	0.347
Prime Word Freq.	12.898	1	62.9	< .001
Target Word Freq.	0.670	1	62.7	0.416

Table 11: Fixed Effects Parameters Estimates

				95% Confidence Interval				
Names	**Effect**	**Estimate**	**SE**	**Lower**	**Upper**	**df**	**t**	**p**
(Intercept)	(Intercept)	671.3367	19.7013	632.7228	709.951	86.4	34.076	< .001
CEFR Level1	B2 - B1	-16.9488	36.7361	-88.9502	55.053	67.8	-0.461	0.646
t-score	t-score	0.0828	0.0656	-0.0459	0.211	62.6	1.261	0.212
MI_score	MI_score	-1.0819	1.1409	-3.3180	1.154	62.9	-0.948	0.347
Prime Word Freq.	Prime Word Freq.	0.7263	0.2022	0.3299	1.123	62.9	3.591	< .001
Target Word Freq.	Target Word Freq.	-0.6214	0.7590	-2.1089	0.866	62.7	-0.819	0.416

The fixed effects whose influence is investigated in the current study can also be seen in Table 11. As shown above, the only significant effect was the prime word frequency as regards the priming of verb+noun collocations. According to Table 11, one unit of change in the prime word frequency variable, which has a statistically significant effect, causes an average increase of 0,7263 units of change in the dependent variable, which is the reaction times of the collocates and non-collocates.

Using subject and items as random effects in reaction time research enables the results of the study at hand more generalizable and true, which conventional analysis methods lack (Carson and Beeson 2013: 27). To be more precise, this study employed a mixed effect modeling analysis in order to incorporate the fixed and random effects in the same model due to the advantages it has been provided in this section. Table 12, therefore, attempts to demonstrate what subjects and items as random effects indicate in the mixed effect modeling analysis. Here, it is interclass correlation

coefficient value that requires attention. With respect to that, mixed effect modeling analysis accommodates that the consistency of the measurements that a researcher obtains multiple times is analyzed by the interclass correlation coefficient (ICC). In the present study, as can be seen in the methodology section, a total of 70 participants reacted to the collocates and non-collocates (N=68), constituting measurements of multiple times of a participant. Within this context, interclass correlation coefficient evaluates the reliability of the estimate by comparing the variability of different estimates of a participant for the total variation against all subjects and all estimates, and is required to be higher than 0.70. According to Table 12, the interclass correlation effect for the subjects was 0,2515, whereas it is 0,0592 for the items in the LDT employed for the study. Accordingly, the interclass correlation effect appears to be weak for both the subjects and items.

Table 12: Random Components

Groups	Name	SD	Variance	ICC
Subject	(Intercept)	135.8	18428	0.2515
Item	(Intercept)	58.7	3451	0.0592
Residual		234.2	54840	

Table 13: Random Effect LRT

Test	N. par	AIC	LRT	df	p
(1 | Item)	8	63539	155	1.00	< .001
(1 | Subject)	8	64424	1040	1.00	< .001

Another result revealed by mixed effect modeling analysis can be seen in Table 13. According to the table, the individual differences between the items are statistically significant taking the reaction times into consideration (p<0,001). Along the same vein, the individual differences between the subjects are also statistically significant (p<0,001). Bearing this in mind, it can be concluded from Table 13 that the reaction times vary across the items and subjects, which warrants further research including additional participants high in number with different proficiency levels, and more types of collocations in order to make comparisons with the results of the current study, and arrive more satisfactory conclusions.

The current study was conducted in order to investigate collocational knowledge of Turkish EFL learners through the theoretical stance of Hoey's influential lexical priming theory. With respect to that, Hoey (2005: 3-5) argues that collocations do not solely occur together by chance, they are rather psychological phenomena in the mental representations of language users. That is, according to the author, words have a tendency to be loaded in the mental lexicon of native speakers with their contexts through linguistic encounters. As a result of this, every word is primed to co-occur with certain other words, which enables language users to produce natural language. Regarding that, Durrant (2008) states that collocations hold a significant priming effect in native

speakers. To substantiate Hoey's theory within a framework where psychological reality of academic verb+noun collocations for non-native speakers is called into question, a lexical decision task (LDT) was designed in which the participants of the study were asked to react to the target words of the collocations and non-collocations to classify them as words or non-words. The software (DMDX) which is widely used in psycholinguistics experiments was utilized in order to measure the reaction times of the participants as regards how long it took them to classify the target words in both collocations and non-collocations as words or non-words. Furthermore, the influence of frequency and language proficiency in the process was also under the scope of the current study.

Bearing the above-mentioned in mind, the findings have been discussed below within the scope of the relevant literature with pedagogical implications and recommendations for further studies to fill in the gaps of the current study. Following is the discussion of the first research question in which implications regarding the lack of priming effect in Turkish EFL learners are provided. Further, the second and third research questions are discussed in *The Role of Frequency* and *The Role of Proficiency* sections, respectively.

4.4. The First Research Question – Collocational Priming in Turkish EFL Learners' Mental Lexicon

In the present study, the results of the LDT demonstrated that Turkish EFL learners did not react to the target words in the collocations significantly faster than the target words in the non-collocations. That is to say, academic verb+noun collocations do not hold a significant priming effect for Turkish EFL learners. Graphic 2 below reiterates that the mean reaction times of the collocates and non-collocates is an evidence of the lack of priming in the learners.

Graphic 2: Mean Reaction Times of the Collocates and Non-Collocates
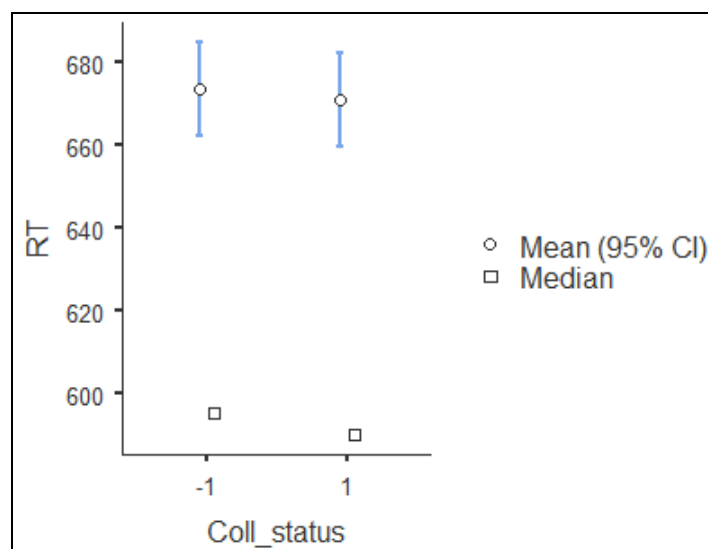
To the researcher's knowledge, no research has been done in an attempt to suggest how and to what extent collocations, or academic collocations for that matter, are primed for Turkish EFL learners. More precisely, the studies investigating English collocational knowledge of Turkish learners have failed to take the psychological reality of collocations into account. However, Cangır et al. (2017) and Cangır (2018), who approached the issue from a slightly different angle, focused on how Turkish collocations are mentally represented for Turkish speakers and Turkish-English bilinguals. The former study investigated collocational priming in Turkish speakers suggesting that Turkish adjective+noun and verb+noun collocations are primed in the mental lexicon of Turkish speakers. Similarly, the latter study demonstrated that collocational priming occurs in the mental lexicon of bilinguals. Such findings when compared to the findings of the current study suggest that Turkish EFL learners fail to process academic verb+noun collocations in their mental lexicon. Therefore, it may be argued that they have not acquired formulaic language and collocational knowledge in order to conform to the native-like standards in their language use and meet the expectations of the academic world. As a consequence, the researcher's hypothesis at the outset of the present study claiming that the reasons behind ill-formed and non-native-like language use of Turkish EFL learners could be attributed to the fact that academic verb+noun collocations are not mentally represented and primed as a single unit in their mental lexicon.

Given that the present study uncovered the psychological reason behind unnatural language use of Turkish EFL learners, lack of priming in their mental lexicon may be the outcome of their prior English instruction. In other words, the participants who took part in the current study may not have been introduced to the formulaic nature of language which has been long pointed out by eminent scholars (Pawley and Syder, 1983; Kjellmer, 1991; Wray, 2002; Ellis, 2003). Accordingly, in a study carried out by Durrant and Schmitt (2009), where native speakers were compared to non-native speakers in terms of their use of collocations, the authors suggested that non-native speakers' lack of collocational knowledge could be pinned down to the suggestion which implies that learners may be insufficiently exposed to the English language. In a similar vein, Wolter and Gyllstad (2013) also state that second language learners may not be as capable as native speakers in terms of processing frequently occurring collocations in language. Such suggestions can be linked to the studies detailed in literature review of the current study, where it is argued that much as learners frequently seem to use formulaic language and collocations in their language production, and despite being grammatically acceptable, they do not conform to the native-like standards (Gitsaki, 1999; De Cock et al., 1998; Granger, 1998; Nesselhauf, 2005). As such, taking the findings of the current study and relevant literature into account, it may be suggested that EFL learners fail to acquire language input they are exposed to in their classes, and as a result, they produce language in an unnatural and non-native-like fashion.

4.5. The Second and Third Research Questions – The Role of Frequency and Proficiency in the Process

4.5.1. The Role of Frequency

Another finding emerging from the current study was observed once mixed effect modeling analysis was manipulated to deal with the second and third research questions. As discussed in *The Results of the Lexical Decision Task* section, the data extracted from the LDT regarding the role of frequency and proficiency were favored to be analyzed with mixed effect modeling due to its prevalent use in psycholinguistics and second language acquisition research besides its suggested advantages over conventional analysis methods. Since mixed effect modeling has been argued to allow researchers to analyze multiple independent variables in the same model regardless of their type such as nominal or quantitative, the researcher opted to apply mixed effect modeling analysis by including t-score and MI score as quantitative variables and proficiency levels of the participants as a nominal variable in the same model. Moreover, mixed effect modeling analysis was considered to be fruitful in the current study since experiments or LDTs, in which reaction times of participants to certain stimuli are measured, are prone to missing data. As far as the methodology of the current study and reaction time research are concerned, reaction times above or below a certain threshold as identified above were regarded as unworthy of the analysis. With respect to that, Cunnings (2012: 372) suggests that mixed effect modeling analysis treats lack of data as if it is missing by chance, therefore it is recognized to yield rather accurate results compared to other analysis models. The last but not least, mixed effect modeling analysis allowed the researcher to include fixed and random effects in the same model, which is claimed to enable the results of the study generalizable to the population (Carson and Beeson, 2013: 27). Considering that, the researcher analyzed the results of the LDT through mixed effect modeling since it was not possible to employ all academic collocations in the experiment or all EFL students nationwide for that matter.

Revisiting the mixed effect modeling results as demonstrated in Table 10 and Table 11 above, this study revealed that Turkish EFL students were not significantly affected by the frequency of collocations. As far as the frequency of collocations is concerned, t-score and MI score are among the most widely used association measures in the relevant literature (Fernandez and Schmitt, 2015: 96). Based on what Table 10 and Table 11 demonstrate, it is observed that t-score and MI score did not have a significant effect in the priming process ($p=0.212>0.05$ and $p=0.347>0.05$, respectively). On the contrary, having revealed that frequency of collocations as a single unit did not significantly affect the priming process, the tables show that prime word frequency (the first word in the collocations) had a significant effect during the process ($p<0.001$).

The fact that collocational frequency (i.e. t-score, MI score) did not have a significant priming effect for the participants in the current study could be attributed to Sinclair's (1991) long celebrated distinction as to how language works, which is termed as the idiom principle and the open-choice principle. Sinclair (1991: 110) suggests that language is predominantly composed of multiword units rather than individual items claiming that "a language user has available to him or her a large number of semi-preconstructed phrases that constitute single choices." What Sinclair refers to is the idiom principle suggesting that language works in such a way in which language users enjoy readily accessible elements at their disposal, and retrieve them from their memory when the need arises to express concepts and ideas. In fact, the idiom principle restrains free choice of linguistic items which is what makes language use natural. For instance, in an attempt to express the verb+noun collocation *commit crime*, a second language learner could replace the verb or noun with numerous alternatives with similar meanings such as *make crime* or *commit guilt* even though most native speakers would naturally say *commit crime*. In this sense, language users who produce an accurate and native-like alternative to express a certain idea or concept can be said to apply the idiom principle. On the other hand, according to Sinclair (1991: 109), the open-choice principle "is a way of seeing language text as the result of a very large number of complex choices." Bearing this in mind, the author suggests that language is composed of slots to be filled with any grammatically acceptable linguistic item. While any grammatically acceptable linguistic item to be used for a concept or idea can be applied in the open-choice principle, naturalness appears to be ignored. In other words, the open-choice principle is a framework where grammar plays a central role, whereas natural language use remains subordinate. As such, the open-choice principle enables language users to make an infinite number of choices during language processing, resulting in unnatural language use even though it is accurate as far as language grammar is concerned. On the other hand, the idiom principle restricts such usage depending on the context, allowing the language to be natural and native-like. As a result, based on Sinclair's language framework and the findings of the present study in which it is shown that frequency of collocations as a single unit does not have a significant effect in the priming process, it can be suggested that EFL learners do not apply the idiom principle in their language processing. More precisely, the learners appear to process language relying on the open-choice principle since the results of the LDT demonstrate that they ignore the pre-patterned nature of collocations.

Having been significantly affected by solely the frequency of the prime words (the first word in the collocations) rather than the frequency of the collocations as a single unit, the reliance on the open-choice principle of the learners as the finding of this study has suggested could have its roots in the first language. That is to say, the mother tongue of the learners may have had an impact on the priming process in the study. As far as the influence of the first language on collocational priming is concerned, the study conducted by Wolter and Yamashita (2014), in which a lexical decision task was conducted with a group of native speakers and two groups of non-native speakers composed of advanced and intermediate level Japanese EFL learners, revealed that incongruent

collocations which are not found in the mother tongue of the learners did not yield significant priming effect in both groups of non-native speakers. To put it another way, in a similar vein with the current study, the collocations in their study did not have a significant priming effect in the mental lexicon of the learners. Conversely, in another study conducted by Wolter and Gyllstad (2011), the findings from the lexical decision task demonstrated collocational priming exists in Swedish learners of English. That is, the collocations in the study had a significant priming effect in the mental lexicon of the Swedish learners. Taking those inconsistent results of two studies into account, it appears the first language may have an influential role in the process. Specifically, the lack of priming effect in the study conducted by Wolter and Yamashita and in the current study could be stemming from the first languages of the participants in both studies. Japanese and Turkish, which were the mother tongues of the learners in both studies, are obviously different languages from English in terms of vocabulary, grammar, and word order, while Swedish, which was the mother tongue of the participants in Wolter and Gyllstad's study, belongs to the same language family as English. Moreover, Swedish learners and native speakers of English geographically and historically are related to one another, whereas Turkish and Japanese learners do not have as many opportunities as Swedish learners to be exposed to the English language. As a result, there appears strong reason to suggest that the influence of mother tongue of the learners in the present study resulted in lack of collocational priming, which may be the reason why Turkish EFL learners process English collocations by applying to the open-choice principle as classified by Sinclair.

The potential effect of the first language as described in the paragraph above can be approached from a different angle as well. That is, it may be argued that the lack of priming effect in the learners' mental lexicon as well as the significant single word frequency in the process could also be attributed to the fact that the word order of the participants' first language and that of English are different. In other words, verb+noun collocations are constituted in a distinct manner in Turkish and English. For instance, the verb+noun collocation *görüşme yapmak* in Turkish is directly translated into English as *call make,* which is unacceptable in the English language. That is to say, verb+noun collocations are echoed as noun+verb collocations in Turkish, in a fashion where nouns are followed by verbs. Based on such discrepancy between the two languages, Turkish EFL learners may unsurprisingly have focused on the single elements of the collocations used in the study rather than processing them as a whole unit in their mental lexicon. As a result, the reason why a significant effect of collocational frequency was not observed could be the result of such different word orders in both languages. As stated in the literature review section of the current study, the study carried out by Frenck-Mestre and Prince (1997) demonstrated that verb+noun collocations are partly primed in non-native speakers whose first language is French. In a similar vein with the discussion given above, French learners of English may have processed collocations better than the learners in the current study as the word order as regards verb+noun collocations in French is the same as in English. Therefore, further studies including participants from various first

language backgrounds by taking the word order are likely to yield more conclusive discussion on the matter.

As aforementioned, Table 10 and Table 11 demonstrate that prime word frequency entertains a significant role in the priming of academic verb+noun collocations for the participants. Such influence of single word frequency rather than the frequency of collocations as a whole unit indicates that Turkish EFL learners may ignore the holistic nature of academic verb+noun collocations. Bearing this in mind, the results of the present study are also in line with Wray's (2002) postulations in that non-native speakers rely on individual elements in collocations contrary to native speakers who focus on collocations as chunks. The possible implication behind such consistency between the current study and Wray's ideas can be ascribed to the suggestion that native speakers and non-native speakers differ in processing collocations in their language processing. As Kjellmer (1991) and Wray (2002) report, learners do not recognize the most natural selection of collocations compared to native speakers in a given situation. That is to say, non-native speakers focus on individual words while they process the language every time they attempt to express their ideas. On the contrary, native speakers naturally retrieve the most idiomatic expression in similar situations. As a result, linguistic production of learners turns out to be unnatural and non-native-like since "the classroom learner homes in on the individual words, and throws away all the really important information, namely, what they occurred with" (Wray, 2002: 206). From this point of view, taking the finding as regards the learners in this study are solely influenced by single word frequency rather than collocational frequency, it can be concluded that EFL learners may be less capable of processing frequently occurring collocations than native speakers. As mentioned earlier, since they appear to be less holistic compared to native speakers, they attempt to generate linguistic items from scratch rather than retrieving them from their mental lexicon as a whole unit when they use the language. Correspondingly, their language production turns out to be non-standard in terms of native speaker norms due to the reliance on individual words and being less holistic.

Much as Kjellmer (1991) and Wray (2002) posit that non-native speakers are not holistic in their approach to processing collocations, indicating that learners generate language from scratch rather than retrieving preconstructed units from their memory, Durrant (2008) approaches the issue from a different angle and suggests that the distinction between native speakers and learners as to how they process formulaic sequences and collocations may not be an innate feature. More precisely, the author states that research which demonstrates learners process collocations holistically has probably ignored the fact that learners may have encountered limited language input in their English instruction. Regarding that, the participants in his study, whose language input was controlled in a training session, appeared to remember adjective+noun collocations in a recall test. Based on the results of the study, the author argued that adult second language learners appear to be capable of distinguishing which words go together in the second language in contrast

to Wray (2002) who suggested that learners focus on individual words while processing language. Reinforcing Durrant's findings, Schmitt (2008: 21) also argues that teaching collocations implicitly with a large amount of exposure may be the best approach, which indicates that second language learners can pick up collocations as a whole from the language input they receive. Regarding that, the current study in which the participants were not significantly affected by collocational frequency as shown in Table 10 and Table 11 above, demonstrated that they focus on constituents of collocations rather than retaining them as a single unit in their mental lexicon. This finding underpins Wray's claims in that learners are not inclined to hold on to collocations from the language they receive. As such, it can be argued that Turkish EFL learners may have been taught collocations implicitly and without extensive exposure to the target language, therefore, their language production becomes unnatural and non-native-like. This suggests that teaching collocations implicitly may not be the best way for second language learners as Schmitt (2008: 21) puts forward.

4.5.2. The Role of Proficiency

Another finding demonstrated in Table 10 and Table 11 is that the proficiency levels of the participants did not have a significant effect in the priming process (p=0.646>0.05). In other words, there was not a significant difference between the two groups of the participants who were split into B1 and B2 proficiency levels in accordance with the CEFR guidelines, and based on the placement test designed by Cambridge University Press (2010). Specifically, both B1 and B2 level learners, who are respectively acknowledged to be intermediate and upper-intermediate levels of proficiency in accordance with the CEFR guidelines, did not react to the collocates significantly faster than they did in response to the non-collocates. Such finding manifests that academic+verb noun collocations are not psychologically real for both intermediate and upper-intermediate learners. Prior to possible implications of this manifestation, it is worth revisiting Table 13 which demonstrates the significance of random effects as a result of mixed effect modeling analysis. As mentioned above, mixed effect modeling allowed the researcher to test the subjects and items as random effects in the same model. Having revealed that the proficiency levels of the learners did not exhibit a significant priming effect in the study, Table 13 shows that individual differences among the subjects were statistically significant.

Such findings in Table 13 may indicate that the variance of reaction times among the participants was large, implying that there were too slow or too fast reaction times. More precisely, some of the participants may have responded to the collocates too slowly or too fast even though the reaction times below or above a certain threshold were removed from the analysis for the purposes of the study. Thus, taking the insignificant effect of the proficiency levels and statistically significant individual differences into account, a need for further research with more participants

and higher as well as lower proficiency levels are evidently needed to reach conclusive results regarding the role of proficiency levels in the mental representations of Turkish EFL learners.

It has been mentioned at the outset that there is a paucity of research regarding the psycholinguistic aspect of collocations regarding Turkish learners of English. Moreover, it has been put forward by Wolter and Gyllstad (2011: 431) that few studies investigated collocations within a psycholinguistics framework. In this sense, there appears insubstantial research on the issue to make comparisons based on the results of the current study regarding the role of proficiency on the priming of academic verb+noun collocations. Nevertheless, as far as collocational knowledge and proficiency levels of learners are concerned, the results of this study are partially in harmony with the relevant research in literature. In particular, Nesselhauf (2003) carried out a corpus study in which she investigated verb+noun collocations as it was done in this study with a group of advanced level German learners of English. Based on the results of her study, she suggested that collocations should be given emphasis in second language teaching as they are challenging even for learners who are ahead in their learning process. Reiterating that the learners in the current study were composed of EFL learners who had B1 and B2 language proficiency levels, and academic verb+noun collocations did not hold a significant priming effect in their mental lexicon, it can be substantiated in light of Nesselhauf's study that not only advanced level learners but also intermediate and upper-intermediate level learners have difficulties while processing verb+noun collocations. In a similar vein to the study conducted by Nesselhauf (2003), Wolter and Yamashita (2014) reported that neither advanced nor intermediate level Japanese EFL learners reacted to collocates in significantly shorter periods of time. That is to say, English collocations which are not found in the first language of the participants did not have a significant priming effect for the advanced and intermediate level learners, which is in harmony with the findings of this study.

Although Wolter and Yamashita (2014) reported Japanese intermediate and advanced level learners of English did not exhibit a significant priming effect regarding collocations, the study conducted by Wolter and Gyllstad (2011), in which the authors employed a lexical decision task in order to find out whether native speakers of English and advanced level Swedish learners of English exhibit significant priming effect in terms of collocations, demonstrated that incongruent collocations are significantly primed in the learners. In other words, the collocations used in the study held a significant priming effect in the mental lexicon of advanced Swedish learners. Contrary to what the current study reveals, and in a similar vein to Wolter and Gyllstad (2011), Durrant's (2008) study which has been mentioned above investigated whether adjective+noun collocations were primed for advanced learners of English with a wide range of L1 backgrounds. The results of the recall test in the study demonstrated that the learners were capable of retaining the collocations in their mental lexicon after a controlled training session.

As far as the role of the language proficiency of learners on the priming of collocations is concerned, there appear to be contradictory findings in the literature. To reiterate the studies presented above, while Wolter and Yamashita (2014) and Nesselhauf (2003) reported that intermediate and advanced level learners have problems as regards processing collocations mentally and using them as native speakers do, the advanced learners in Durrant (2008) and Wolter and Gyllstad (2011) appeared to retain and process collocations in their mental representations. Such contradictions in literature may be due to the fact that collocations are defined and approached from a wide range of viewpoints based on cognitive and usage-based models. Moreover, studies attempting to investigate collocational knowledge employ varying instruments such as corpora or lexical decision tasks with learners of differing language proficiency levels and backgrounds. For instance, Nesselhauf's study employed a corpus methodology with advanced level German learners of English, whereas Wolter and Gyllstad investigated collocational knowledge of high proficiency learners with a lexical decision task to find links in the mental lexicon. Therefore, those contradictory findings regarding the role of proficiency in the priming process warrant further research in order to reach more conclusive suggestions.

Taking the findings of the studies discussed above into account, the insignificant difference between the intermediate and upper-intermediate learners who took part in the current study can be addressed by Wray's (2002) claims through which she suggested adult language learners do not recognize the holistic nature of formulaic sequences and collocations even when they are in advanced levels of language proficiency. Along the same vein, the current study demonstrated that not only advanced level second language learners but also intermediate level learners fail to process collocations as a whole in their mental lexicon. That is, they attempt to generate linguistic items from scratch rather than retrieving them as a whole from their memory by conforming to the open-choice principle as described by Sinclair (1991). This suggests that B1 and B2 proficiency learners (intermediate and upper-intermediate, respectively) may not be capable of grasping the holistic nature of collocations as single units even when they are exposed to a large amount of input and taught implicitly as Schmitt (2008: 21) suggested. Therefore, it can be argued that intermediate and upper-intermediate level learners should be taught academic verb+noun collocations explicitly. Still, based on the inconsistent results regarding the role of proficiency in the relevant literature, the first language of learners and the task type may play a key role in determining how proficiency affects the priming process. From this point of view, further research with a larger scale is undoubtedly essential. It appears the literature regarding the role of proficiency on the mental representation of collocations in learners remains inconclusive to suggest whether there is a significant difference among proficiency levels. As a result, it seems unattainable at this point to suggest that intermediate and high proficiency learners can process collocations in their mental lexicon as well as native speakers.

CONCLUSION AND RECOMMENDATIONS

Summary of the Study

The current study investigated whether academic verb+noun collocations are primed as a single unit in Turkish EFL learners. That is, the study aimed to find out whether academic verb+noun collocations are primed for those who study at ELL and ELT departments of universities to presumably become English teachers. Additionally, the study aimed to find out if and to what extent frequency of collocations as a single unit and frequency of constituent words belonging to the collocations play a role in the process. Moreover, a potential effect of the language proficiency levels of the participants was also within the scope of this study. To serve the purposes of the study, a priming experiment, a lexical decision task (LDT) in particular, was designed to be conducted with the participation of 71 EFL students studying at the ELL department of Gümüşhane University. The items used in the experiment were all verb+noun academic collocations which were taken from Pearson International Corpus of Academic English (PICAE) list (Ackermann and Chen, 2013). The viewpoint as regards opting for verb+noun collocations was that those types of collocations were suggested to be problematic and challenging for EFL learners (Nesselhauf, 2005; Bıçkı, 2012). Since priming was considered to be affected by frequency, those verb+noun collocations having a minimum frequency value of 3.0 MI score and 2.0 t-score were considered to be eligible for the LDT. As can be seen in *Methodology* section, the collocations extracted from the PICAE list were then accompanied by non-collocations, fillers, and non-words (See Appendix 4). The fillers and non-words were solely used to refrain the participants from developing strategies. During the LDT, the participants classified the target words (the second word in a collocation) as a word or non-word by using the pre-specified buttons on the keyboard after they were shown the flashing prime words (the first word in a collocation) (See Table 3). The reaction times, which is how long it took the participants to classify the target word in each pair as a word or non-word, were measured in milliseconds by utilizing the psycholinguistics experiment software (DMDX). Based on the results of the experiment, it was revealed that there was not a significant difference between the reaction times of the collocates and non-collocates. In other words, the participants did not react to the target words of the collocations significantly faster than the target words of the non-collocations, which demonstrates that academic verb+noun collocations are not primed as a single unit in the mental lexicon of Turkish EFL learners (See Table 8 and Graphic 1). Moreover, mixed effect modeling analysis of the results at the end of the LDT demonstrated that the proficiency levels of the participants did not have a significant effect during the processing of the collocations in the mental lexicon. Finally, only the frequency of the prime words (the first word in a

collocation) was found to significantly affect the process, whereas the frequency of the collocations as a single unit did not hold a significant priming effect.

Limitations of the Study

Given the fact that priming experiments, namely LDTs are time-consuming and expensive to conduct, the current study is limited to the findings of a single lexical decision task which was conducted with 71 EFL learners studying at the ELL department of Gümüşhane University. Therefore, the findings of the study may not be generalizable to all EFL learners studying at ELL or ELT departments in Turkey. Regarding that, Carson and Beeson (2013: 27) suggest that one merit of mixed effect modeling, with which the data were analyzed in this study, is that it allows participants and items of experiments to be included as random effects in the model. As a result, the authors claim that such feature of mixed effect modeling enables results of psycholinguistic experiments or LDTs to be generalizable to the population. However, the findings of this study are advised to be approached tentatively.

As stated at the outset, this study was solely concerned with academic verb+noun collocations as they have been argued to be problematic and challenging for EFL learners in the relevant literature, which was assumed to be the reason behind the learner's unnatural and non-native-like language use (Nesselhauf, 2005; Bıçkı, 2012). In this sense, further research, especially regarding Turkish EFL learners and priming phenomenon in their mental lexicon, may include other types of collocations. As such, the gaps provided here may be useful for further studies, for which suggestions are given below.

Implications and Suggestions for Further Studies

The current study investigated whether academic verb+noun collocations are primed in Turkish learners of English besides bringing the potential role of frequency and language proficiency under the spotlight. As far as priming of collocations is concerned, it is defined as a psycholinguistic association between constituent parts of collocations rather than a manifestation of mere textual co-occurrence of words (Hoey, 2005: 3-5). Based on this description of collocations, Hoey suggests that they should be defined in psycholinguistic terms since words do not haphazardly occur together in texts. That is, each word in language is primed to be used with certain other words depending on the context, which is spelled out as collocational priming (ibid: 13). From this point of view, the choice of a word following another word is in the mental lexicon of native speakers as they happen to be loaded such knowledge through linguistic encounters in their unique language experiences. In this sense, collocational priming ensures natural language use (ibid: 6-186). As underlined throughout this study, such natural language use achieved by collocational priming is assumed be missing in Turkish EFL learners. Bearing this in mind, this

study is of value in that it attempts to seek collocational knowledge of Turkish EFL learners who are likely to be ELT teachers in the future with reference to priming phenomenon. As stated earlier, there appears to be lack of research centering on priming of collocations in the second language (Wolter and Gyllstad, 2011: 431). Moreover, to the researcher's knowledge, the relevant literature lacks evidence regarding collocational knowledge of Turkish EFL learners through psycholinguistics terms. As such, taking collocational priming into consideration, it was demonstrated in the current study that Turkish EFL learners sound unnatural and non-native-like in their language production as academic verb+noun collocations were not found to be primed in their mental lexicon. Regarding that, Hoey (2005: 6-186) argues that priming phenomenon allows language users to choose the most idiomatic and natural expression in a given context, thus it is an explanation to the naturalness in language. As a result, in light of what Hoey (ibid: 1) calls as "a new theory of language", which is lexical priming theory, and based on the findings of the current study, it could be suggested that Turkish EFL learners do not conform to the native-like and academic standards of the English language and sound unnatural in their linguistic preferences.

The first implication that can be drawn from the present study is that EFL learners may not have been introduced to the formulaic and holistic nature of collocations. As a result, their language production becomes unnatural and non-native-like. Therefore, it may be argued that they should be taught academic verb+noun collocations explicitly in EFL classrooms before they embark on studying at ELT and ELL departments of universities. As far as unnatural language use is concerned, Hoey (2005: 186) states that when primings of language users do not match their potential readers and listeners, the outcome will be definitely unnatural. The author also claims that textbooks could yield unnatural primings in the mental lexicon. This suggests that linguistic experience encountered in textbooks or language input from the outside world can impair, or improve for that matter, priming phenomenon. Taking this into account, teaching academic verb+noun collocations explicitly could improve learners' primings in such a way that native speakers would find natural, which could hamper the non-native-like language use of them.

Another implication that can be arrived from the results of the current study is that the learners apply the open-choice principle when they process the language. As discussed in *Literature Review* section of this study, according to the Sinclair's dichotomy (1991: 109-110) as to how language works in mind, the open-choice principle highlights a framework where the only obstacle to produce language is the grammaticalness. That is to say, language works in such a fashion in which there appears a large number of alternatives to choose a word after another in the open-choice principle model, which may result in unnatural language use. More precisely, the open-choice principle suggests that even though learners can produce grammatically acceptable language, the idiomaticity and naturalness can still be a matter of question. On the other hand, the idiom principle model suggests linguistic items to be used in accordance with the relevant topic or context. Such feature of the idiom principle allows linguistic choices to be natural and native-like.

In this sense, while the open-choice principle is associated with what is possible in language, the idiom principle is concerned with what is probable (Hoey, 2005). Considering the distinction between the open-choice principle and the idiom principle, Turkish EFL learners could be argued to ignore the idiom principle model in their language use. Therefore, the findings of this study suggest that learners should be conditioned to take note of the idiom principle in their approach to how language works in mind. Being aware of the holistic nature of the language and the idiom principle, learners can be rather meticulous in their attempts to speak or write, the outcome of which may be natural and native-like language use. As far as raising learners' awareness in terms of collocations and how they are primed in native speakers is concerned, Jiang and Yamashita (2010: 663) suggest that when non-native EFL teachers who have the same first language as their learners foresee challenging nature of collocations, they can accordingly tune in their instruction, and help learners pay attention to collocational differences between L1 and L2. From this point of view, since the findings of the current study demonstrated that academic verb+noun collocations are not primed in Turkish EFL learners, EFL teachers may draw their learners' attention to how collocations are useful and how language works in mind with the idiom principle so as to achieve native-like language use.

Having suggested that Turkish EFL learners should be introduced to the holistic nature of the language and how language works in mind as the idiom principle postulates based on the findings of this study, it can also be argued that teaching collocations with a large amount of exposure may not suffice to make learners acquire them unlike what Schmitt (2008: 21) put forward. As stated in *Findings and Discussion* section, this study demonstrated that the learners were not significantly affected by the frequency of collocations. Rather, the frequency of the prime word had a significant influence on them. Such significant effect of single word frequency implies that Turkish EFL learners remain analytic towards collocations when they encounter them. Therefore, they break up collocations rather than retrieving them as a whole from their memory as Wray (2002) postulates. In this sense, since the learners appear to be analytic rather than holistic in their approach to the language, they may not cognitively and innately differentiate which words go together in their linguistic production. As such, teaching collocations implicitly with extensive exposure may not be enough for the learners. Rather, teaching them explicitly and making learners gain awareness as regards the formulaic nature of collocations may yield native-like language since such knowledge was not readily found in their mental lexicon as far as the current study attempted to put forward.

As a final note on the concluding remarks of this study, it is worth underlining the following points for further studies to conscientiously approach the matter at hand here. First of all, the role of the first language stood out as one of the key findings of the current study. Specifically, contrary to the study carried out by Wolter and Gyllstad (2011), it was unearthed that verb+noun collocations did not hold a significant priming effect in the mental lexicon of EFL learners. Considering that the collocations were primed in Swedish learners in Wolter and Gyllstad's study,

further research should be done including learners from varying first language backgrounds in order to reach sound conclusions. It has been discussed above that while the collocations in Wolter and Gyllstad's study had a significant effect on Swedish learners of English, they did not exhibit such effect in Japanese learners of English in Wolter and Yamashita (2014). This may stem from the fact that English and Swedish belong to the same language family while Japanese is both geographically and orthographically distant to English. Likewise, Turkish is different from English in terms of word order, vocabulary, grammar, etc., implying that the first language of the learners may have played a crucial role in the absence of priming in their mental representations. Therefore, future studies could include learners not only from orthographically similar languages but also languages whose speakers are geographically distant from English speaking countries so as to make further arguments on the issue. Another suggestion for those who are on the verge of embarking on a similar study could be specified with the language proficiency level of participants. As the results of this study demonstrated, there was not a significant difference between the intermediate and upper-intermediate level learners in terms of priming of verb+noun collocations. Accordingly, studies to be conducted in the future could take higher as well as lower language proficiencies into consideration to make comparisons with the current study and similar studies. Learners' language backgrounds, overseas experience, and ages can also be incorporated as variables which may have an influence on the priming of collocations. Furthermore, as far as what further research can include to reinforce or refute the findings of this study, other collocation alternatives than verb+noun pairs such as adjective+noun and noun+verb pairs as categorized by Benson et al. (2009) and shown in Table 1 and Table 2 can be taken into account. Last but not least, since the first language of learners appears to be instrumental in the priming process, further research can consider congruent and incongruent word pairs to be included in priming experiments. In other words, whether collocation pairs have direct translations in the first language of participants could be a fruitful variable.

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APPENDIXES

Appendix 1: DMDX Codes for the LDT

```
<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";$

$+225 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "do" / <ms% 83>/ * "EXPERIMENTS" ;$

$+225 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "go" / <ms% 83>/ * "LIGHTER" ;$

$+225 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "do" / <ms% 83>/ * "BLIRTH" ;$

$+225 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "make" / <ms% 83>/ * "CAKE" ;$

$+225 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "take" / <ms% 83>/ * "MEASURE" ;$

$+225 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "have" / <ms% 83>/ * "BREAKFAST" ;$

$00 <ln -1> "Press SPACE for",

<ln 0> "the Real Test",

<ln 1> "Respond as fast as",

<ln 2> "you can, please!";$

+1 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "draw" / <ms% 83>/ * "ATTENTION" ;

+2 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "cause" / <ms% 83>/ * "ATTENTION" ;

+3 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "knit" / <ms% 83>/ * "EMPHASIS" ;

-250 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "obey" / <ms% 83>/ * "STROUCHE" ;

+4 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "reach" / <ms% 83>/ * "PEAK" ;

+5 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "die" / <ms% 83>/ * "PEAK" ;

+6 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "crash" / <ms% 83>/ * "ARMY" ;

-251 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "admit" / <ms% 83>/ * "CANC" ;

+7 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "gain" / <ms% 83>/ * "ACCESS" ;

+8 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "mark" / <ms% 83>/ * "ACCESS" ;

+9 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "chew" / <ms% 83>/ * "AUTHOR" ;
```

-252 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "blow" / <ms% 83>/ * "WHUNCH" ;

+10 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "assess" / <ms% 83>/ * "IMPACT" ;

+11 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "recall" / <ms% 83>/ * "IMPACT" ;

+12 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "cancel" / <ms% 83>/ * "BALANCE" ;

-253 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "confuse" / <ms% 83>/ * "THWAIF" ;

+13 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "focus" / <ms% 83>/ * "ATTENTION" ;

+14 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "cope" / <ms% 83>/ * "ATTENTION" ;

+15 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "spill" / <ms% 83>/ * "KNOWLEDGE" ;

-254 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "delay" / <ms% 83>/ * "SKEIGHTH" ;

+16 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "achieve" / <ms% 83>/ * "OBJECTIVE" ;

+17 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "contain" / <ms% 83>/ * "OBJECTIVE" ;

+18 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "donate" / <ms% 83>/ * "BROADCAST" ;

-255 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "examine" / <ms% 83>/ * "SCREATHE" ;

+19 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "encounter" / <ms% 83>/ * "DIFFICULTIES" ;

+20 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "disappear" / <ms% 83>/ * "DIFFICULTIES" ;

+21 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "discover" / <ms% 83>/ * "PROFESSION" ;

-256 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "generate" / <ms% 83>/ * "SPRORQUE" ;

+22 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "deny" / <ms% 83>/ * "ACCESS" ;

+23 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "hang" / <ms% 83>/ * "ACCESS" ;

+24 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "bear" / <ms% 83>/ * "PIRATE" ;

-257 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "permit" / <ms% 83>/ * "THWALC" ;

+25 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "perform" / <ms% 83>/ * "TASK" ;

+26 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "imagine" / <ms% 83>/ * "TASK" ;

+27 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "pretend" / <ms% 83>/ * "HEAT" ;

-258 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "prohibit" / <ms% 83>/ * "BRET" ;

+28 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "publish" / <ms% 83>/ * "ARTICLE" ;

+29 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "argue" / <ms% 83>/ * "ARTICLE" ;

+30 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "succeed" / <ms% 83>/ * "THUNDER" ;

-259 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "measure" / <ms% 83>/ * "PHLERSE" ;

+31 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "accept" / <ms% 83>/ * "RESPONSIBILITY" ;

+32 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "reduce" / <ms% 83>/ * "RESPONSIBILITY" ;

+33 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "affect" / <ms% 83>/ * "CELEBRATION" ;

-260 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "bleed" / <ms% 83>/ * "SPLAITCH" ;

+34 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "create" / <ms% 83>/ * "IMPRESSION" ;

+35 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "return" / <ms% 83>/ * "IMPRESSION" ;

+36 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "scream" / <ms% 83>/ * "FRIENDSHIP" ;

-261 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "boast" / <ms% 83>/ * "THEIGHTH" ;

+37 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "raise" / <ms% 83>/ * "QUESTION" ;

+38 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "rise" / <ms% 83>/ * "QUESTION" ;

+39 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "charge" / <ms% 83>/ * "VIOLENCE" ;

-262 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "recall" / <ms% 83>/ * "STROURSE" ;

+40 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "conduct" / <ms% 83>/ * "RESEARCH" ;

+41 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "touch" / <ms% 83>/ * "RESEARCH" ;

+42 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "satisfy" / <ms% 83>/ * "CHOICE" ;

-263 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "vanish" / <ms% 83>/ * "THROURSE" ;

+43 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "change" / <ms% 83>/ * "ATTITUDE" ;

+44 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "produce" / <ms% 83>/ * "ATTITUDE" ;

+45 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "comment" / <ms% 83>/ * "CONCERN" ;

-264 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "defeat" / <ms% 83>/ * "SHRASQUE" ;

$0<ln 0> "Take a break….",

<ln 1> "Press SPACE when ready"; $

+46 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "encourage" / <ms% 83>/ * "DEVELOPMENT" ;

+47 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "identify" / <ms% 83>/ * "DEVELOPMENT" ;

+48 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "influence" / <ms% 83>/ * "ANNIVERSARY" ;

-265 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "struggle" / <ms% 83>/ * "SCREETHE" ;

+49 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "seek" / <ms% 83>/ * "HELP" ;

+50 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "prove" / <ms% 83>/ * "HELP" ;

+51 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "lock" / <ms% 83>/ * "ROPE" ;

-266 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "deny" / <ms% 83>/ * "GLEL" ;

+52 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "take" / <ms% 83>/ * "RESPONSIBILITY" ;

+53 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "see" / <ms% 83>/ * "RESPONSIBILITY" ;

+54 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "treat" / <ms% 83>/ * "EMBARRASSEMENT" ;

-267 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "warn" / <ms% 83>/ * "PHRUICHE" ;

+55 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "offer" / <ms% 83>/ * "OPPORTUNITY" ;

+56 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "fall" / <ms% 83>/ * "OPPORTUNITY" ;

+57 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "stare" / <ms% 83>/ * "CONSQUENCE" ;

-268 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "reply" / <ms% 83>/ * "PHLOURCE" ;

+58 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "adopt" / <ms% 83>/ * "APPROACH" ;

+59 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "attend" / <ms% 83>/ * "APPROACH" ;

+60 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "faint" / <ms% 83>/ * "EMOTION" ;

-269 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "apply" / <ms% 83>/ * "PHLAUNCH" ;

+61 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "make" / <ms% 83>/ * "ARRANGEMENTS" ;

+62 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "get" / <ms% 83>/ * "ARRANGEMENTS" ;

+63 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "hold" / <ms% 83>/ * "EXPECTATIONS" ;

-270 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "bend" / <ms% 83>/ * "FREIGHTH" ;

+64 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "become" / <ms% 83>/ * "FOCUS" ;

+65 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "work" / <ms% 83>/ * "FOCUS" ;

+66 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "shine" / <ms% 83>/ * "ENEMY" ;

-271 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "sink" / <ms% 83>/ * "THURN" ;

+67 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "face" / <ms% 83>/ * "DIFFICULTIES" ;

+68 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "occur" / <ms% 83>/ * "DIFFICULTIES" ;

+69 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "chop" / <ms% 83>/ * "CALCULATIONS" ;

-272 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "dive" / <ms% 83>/ * "THRIRQUE" ;

+70 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "experience" / <ms% 83>/ * "DIFFICULTIES" ;

+71 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "contribute" / <ms% 83>/ * "DIFFICULTIES" ;

+72 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "justify" / <ms% 83>/ * "SURROUNDINGS" ;

-273 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "maintain" / <ms% 83>/ * "SCREAGUE" ;

+73 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "allow" / <ms% 83>/ * "ACCESS" ;

+74 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "consider" / <ms% 83>/ * "ACCESS" ;

+75 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "educate" / <ms% 83>/ * "FLAVOUR" ;

-274 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "kneel" / <ms% 83>/ * "CLEWTH" ;

+76 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "follow" / <ms% 83>/ * "INSTRUCTIONS" ;

+77 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "seem" / <ms% 83>/ * "INSTRUCTIONS" ;

+78 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "reject" / <ms% 83>/ * "ENTHUSIASM" ;

-275 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "escape" / <ms% 83>/ * "BLEIGHTH" ;

+79 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "give" / <ms% 83>/ * "EVIDENCE" ;

+80 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "think" / <ms% 83>/ * "EVIDENCE" ;

+81 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "tear" / <ms% 83>/ * "MOUNTAIN" ;

-276 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "stir" / <ms% 83>/ * "GREIGHTH" ;

+82 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "use" / <ms% 83>/ * "RESOURCES" ;

+83 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "look" / <ms% 83>/ * "RESOURCES" ;

+84 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "force" / <ms% 83>/ * "FORTUNE" ;

-277 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "tend" / <ms% 83>/ * "SPRIRQUE" ;

+85 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "require" / <ms% 83>/ * "KNOWLEDGE" ;

+86 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "appear" / <ms% 83>/ * "KNOWLEDGE" ;

+87 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "achieve" / <ms% 83>/ * "AGREEMENT" ;

-278 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "succeed" / <ms% 83>/ * "SCROARSE" ;

+88 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "cover" / <ms% 83>/ * "AREA" ;

+89 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "wish" / <ms% 83>/ * "AREA" ;

+90 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "swear" / <ms% 83>/ * "FRAME" ;

-279 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "remind" / <ms% 83>/ * "JAIT" ;

$0<ln 0> "Take a break….",

<ln 1> "Press SPACE when ready"; $

+91 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "develop" / <ms% 83>/ * "ARGUMENT" ;

+92 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "remain" / <ms% 83>/ * "ARGUMENT" ;

+93 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "regard" / <ms% 83>/ * "LAUGHTER" ;

-280 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "tremble" / <ms% 83>/ * "PHLOATHE" ;

+94 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "support" / <ms% 83>/ * "ARGUMENT" ;

+95 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "introduce" / <ms% 83>/ * "ARGUMENT" ;

+96 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "squeeze" / <ms% 83>/ * "INVASION" ;

-281 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "approve" / <ms% 83>/ * "PHROURTH" ;

+97 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "present" / <ms% 83>/ * "EVIDENCE" ;

+98 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "manage" / <ms% 83>/ * "EVIDENCE" ;

+99 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "confirm" / <ms% 83>/ * "HEAVEN" ;

-282 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "destroy" / <ms% 83>/ * "CLORCH" ;

+100 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "explore" / <ms% 83>/ * "ISSUE" ;

Appendix 1: (Continue)

+101 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "invest" / <ms% 83>/ * "ISSUE" ;

+102 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "calculate" / <ms% 83>/ * "HERO" ;

-283 <ms% 250> "*" / <ms% 500> "##########" / <ms% 67> "consist" / <ms% 83>/ * "NILCH" ;

$0 "Thanks for your patience";$

Appendix 2: The End of Experiment Questionnaire - Deney Sonu Anketi (Turkish)

1. *Ad ve Soyadınız**
   _____

2. *E-mail adresiniz?**
   _____

*1. ve 2. soruya cevap vermek zorunda değilsiniz. Bu bilgiler yalnızca deney sonuçlarına yönelik daha kapsamlı bilgi edinebilmek durumunda kalındığında, sizinle iletişime geçmek için kullanılacaktır.

Katılmış olduğunuz deneyin güvenirliğini arttırmak amacıyla, aşağıdaki soruları içtenlikle yanıtlamanız gerekmektedir. Katkılarınızdan dolayı teşekkür ederim.

Öğr. Gör. Ahmet AKTÜRK

3. Yaşınız
   _____

4. Cinsiyetiniz
   Yalnızca bir şıkkı işaretleyiniz.

   ☐ Kadın
   ☐ Erkek
   ☐ Belirtmemeyi tercih ediyorum

5. Ciddi bir görme bozukluğunuz var mı?
   Yalnızca bir şıkkı işaretleyiniz.

   ☐ Evet
   ☐ Hayır

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 işaretleyiniz.

   ☐ Evet
   ☐ Hayır

7. Baskın eliniz hangisi?
   Yalnızca bir şıkkı işaretleyiniz.

   ☐ Sağ
   ☐ Sol
   ☐ Her iki elimi de aynı baskınlıkta/sıklıkta kullanırım

Appendix 2: (Continue)

8. Deney sırasında ekranda uzunca bir süre görünen, cevap vermeniz gereken kelimeleri okumakta zorlandınız mı?

☐ Evet
☐ Hayır

9. Deney sırasında ekranda anlık görünen (kısa bir süreliğine yanıp sönen) kelimeleri fark edebildiniz mi?
Bu soruda ekranda uzun süre durup da cevap vermeniz gereken kelimeler
KASTEDİLMEMEKTEDİR.
Yalnızca bir şıkkı işaretleyiniz.

☐ Hepsini okuyabildim/fark edebildim
☐ Çoğunu okuyabildim/fark edebildim
☐ Birkaçını okuyabildim/fark edebildim
☐ Hiçbirini okuyamadım/fark edemedim

10. Eğer fark ettiyseniz, deney sırasında anlık görünen (kısa bir süreliğine yanıp sönen) hatırladığınız kelimeleri aşağıya not edebilir misiniz?

_____

_____

_____

_____

_____

_____

_____

_____

Appendix 3: Deneye Gönüllü Katılım Formu

Sevgili öğrenciler,

Katılacağınız deney, "Investigation of Collocational Priming in Tertiary Level Turkish EFL Learners' Mental Lexicon - Yabancı Dil Olarak İngilizce Öğrenen Üniversite Öğrencilerinin Zihinsel Sözlüklerindeki Eşdizimli Kelime Öncelemesi" adıyla, Öğr. Gör. Ahmet Aktürk tarafından 2019-2020 Akademik Yılı içinde yüksek lisans tezi için yapılan araştırma kapsamındadır. Bu çalışma, ana dili Türkçe yabancı dili İngilizce olan öğrencilerde akademik eşdizimli kelimelerin öncelenip öncelenmediğini araştırmaktadır. Bunun yanında, kelimelerin sıklığının ve öğrencilerin seviyesinin eşdizimli kelime önceleme üzerine etkisi de bu çalışma kapsamında incelenmektedir.

Bu araştırmaya katılım tamamen gönüllülük esasına dayanmaktadır. Deneyde vereceğiniz cevaplar gizli tutulacak ve sadece araştırmacı tarafından kullanılacaktır. Bu hususta, çalışma sırasında vereceğiniz bilgiler ve çalışmadan elde edilecek veriler sadece araştırma kapsamında değerlendirilecek ve üçüncü kişilerle herhangi bir şekilde paylaşılmayacaktır.

Deney sırasında herhangi bir sebepten dolayı kendinizi kötü hissederseniz deneyi tamamlamayabilirsiniz.

Deneye başlamadan önce sormak istediğiniz soruları bana yöneltebilirsiniz. Ayrıca deneyden sonra aşağıdaki iletişim bilgilerinden bana ulaşarak sonuçlarla ile ilgili bilgi isteyebilirsiniz.

Öğr. Gör. Ahmet Aktürk

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Adres : Gümüşhane Üniversitesi, Mühendislik ve Doğa Bilimleri Fakültesi, Yabancı Diller Bölümü, No: 607

Yukarıda bilgileri bulunan araştırmaya katılmayı kabul ediyorum.

Tarih :

Ad-Soyad

İmza

Appendix 4: The Items Used in the Study

1.	Collocation	Non-Collocation	Filler	Non-Word
	draw attention	cause attention	knit emphasis	obey strouche
Frequency of the Node	21,579 192.08 per million	20,030 178.29 per million	-	-
t-score	38.34	-89.47	-	-
MI score	9.14	-11.46	-	-
2.	Collocation	Non-Collocation	Filler	Non-Word
	reach peak	die peak	crash army	admit canc
Frequency of the Node	22,446 213.4 per million	21,909 195.01 per million	-	-
t-score	15.12	-23.46	-	-
MI score	8.31	-9.53	-	-
3.	Collocation	Non-Collocation	Filler	Non-Word
	gain access	mark access	chew author	blow whunch
Frequency of the Node	8,406 74.82 per million	7,802 69.45 per million	-	-
t-score	18.31	-26.09	-	-
MI score	8.71	-9.69	-	-
4.	Collocation	Non-Collocation	Filler	Non-Word
	assess impact	recall impact	cancel balance	confuse thwaif
Frequency of the Node	6,379 56.78 per million	5,353 47.65 per million	-	-
t-score	9.91	-13.26	-	-
MI score	7.83	-8.71	-	-
5.	Collocation	Non-Collocation	Filler	Non-Word
	focus attention	cope attention	spill knowledge	delay skeighth
Frequency of the Node	5,357 47.68 per million	5,013 44.62 per million	-	-
t-score	18.89	-22.36	-	-
MI score	9.11	-9.46	-	-
6.	Collocation	Non-Collocation	Filler	Non-Word
	achieve objective	contain objective	donate broadcast	examine screathe
Frequency of the Node	16.725 148.87 per million	17,964 159.9 per million	-	-
t-score	17.81	-43.81	-	-
MI score	7.93	-10.43	-	-

Appendix 4: (Continue)

7.	Collocation	Non-Collocation	Filler	Non-Word
	encounter difficulties	disappear difficulties	discover profession	generate sprorque
Frequency of the Node	2,642 23.52 per million	5,514 49.08 per million	-	-
t-score	7.96	-23.53	-	-
MI score	7.71	-9.54	-	-
8.	Collocation	Non-Collocation	Filler	Non-Word
	deny access	hang access	bear pirate	permit thwalc
Frequency of the Node	7,446 66.28 per million	8,625 76.77 per million	-	-
t-score	10.66	-28.85	-	-
MI score	7.34	-9.83	-	-
9.	Collocation	Non-Collocation	Filler	Non-Word
	perform task	imagine task	pretend heat	prohibit bret
Frequency of the Node	8,882 79.06 per million	8,116 72.24 per million	-	-
t-score	13.19	-33.61	-	-
MI score	7.52	-10.05	-	-
10.	Collocation	Non-Collocation	Filler	Non-Word
	publish article	argue article	succeed thunder	measure phlerse
Frequency of the Node	12,426 110.61 per million	14,611 130.05 per million	-	-
t-score	9.44	-44.82	-	-
MI score	6.64	-10.47	-	-
11.	Collocation	Non-Collocation	Filler	Non-Word
	accept responsibility	reduce responsibility	affect celebration	bleed splaitch
Frequency of the Node	20,320 181.22 per million	19,166 170.6 per million	-	-
t-score	9.67	-75.36	-	-
MI score	6.90	-11.21	-	-
12.	Collocation	Non-Collocation	Filler	Non-Word
	create impression	return impression	scream friendship	boast theighth
Frequency of the Node	21,419 190.65 per million	20,577 183.16 per million	-	-
t-score	5.14	-32.49	-	-
MI score	6.50	-10.00	-	-

13.	Collocation	Non-Collocation	Filler	Non-Word
	raise question	rise question	charge violence	recall strourse
Frequency of the Node	20,117 179.06 per million	17,008 151.39 per million	-	-
t-score	15.69	-213.18	-	-
MI score	6.42	-12.71	-	-
14.	Collocation	Non-Collocation	Filler	Non-Word
	conduct research	touch research	satisfy choice	vanish throurse
Frequency of the Node	5,025 44.73 per million	6,253 55.66 per million	-	-
t-score	9.16	-54.93	-	-
MI score	6.40	-10.76	-	-
15.	Collocation	Non-Collocation	Filler	Non-Word
	change attitude	produce attitude	comment concern	defeat shrasque
Frequency of the Node	28,032 249.52 per million	29,928 266.39 per million	-	-
t-score	6.60	-104.31	-	-
MI score	5.90	-11.68	-	-
16.	Collocation	Non-Collocation	Filler	Non-Word
	encourage development	identify development	influence anniversary	struggle screethe
Frequency of the Node	12,173 108.35 per million	13,318 118.54 per million	-	-
t-score	10.41	-161.88	-	-
MI score	5.61	-12.32	-	-
17.	Collocation	Non-Collocation	Filler	Non-Word
	seek help	prove help	lock rope	deny glel
Frequency of the Node	16,690 148.6 per million	14,448 128.6 per million	-	-
t-score	11.11	-48.91	-	-
MI score	4.92	-10.59	-	-
18.	Collocation	Non-Collocation	Filler	Non-Word
	take responsibility	see responsibility	treat embarrassement	warn phruiche
Frequency of the Node	173,646 1,545.64 per million	184,872 1,645.56 per million	-	-
t-score	25.99	-727.22	-	-
MI score	5.28	-14.48	-	-

19.	Collocation	Non-Collocation	Filler	Non-Word
	offer opportunity	fall opportunity	stare consequence	reply phlource
Frequency of the Node	27,712 246.67 per million	26,535 236.19 per million	-	-
t-score	9.52	-136.87	-	-
MI score	6.26	-12.07	-	-
20.	Collocation	Non-Collocation	Filler	Non-Word
	adopt approach	attend approach	faint emotion	apply phlaunch
Frequency of the Node	8,872 78.97 per million	8,997 80.08 per million	-	-
t-score	8.14	-511.04	-	-
MI score	5.22	-13.98	-	-
21.	Collocation	Non-Collocation	Filler	Non-Word
	make arrangements	get arrangements	hold expectations	bend freighth
Frequency of the Node	209,867 1,868.05 per million	208,360 1,854.163 per million		
t-score	6.13	-608.31		
MI score	5.78	-14.23		
22.	Collocation	Non-Collocation	Filler	Non-Word
	become focus	work focus	shine enemy	sink thurn
Frequency of the Node	66,112 588.47 per million	65,955 587.07 per million	-	-
t-score	12.14	-90.67	-	-
MI score	4.87	-11.48	-	-
23.	Collocation	Non-Collocation	Filler	Non-Word
	face difficulties	occur difficulties	chop calculations	dive thrirque
Frequency of the Node	16,886 150.3 per million	15,462 137.03 per million	-	-
t-score	10.45	-66.04	-	-
MI score	5.86	-11.02	-	-
24.	Collocation	Non-Collocation	Filler	Non-Word
	experience difficulties	contribute difficulties	justify surroundings	maintain screague
Frequency of the Node	6,487 57.74 per million	6,329 56.34 per million	-	-
t-score	14.02	-27.01	-	-
MI score	8.05	-9.74	-	-

25.	**Collocation**	**Non-Collocation**	**Filler**	**Non-Word**
	allow access	consider access	educate flavour	kneel clewth
Frequency of the Node	33,551 298.64 per million	30,253 269.28 per million	-	-
t-score	13.18	-101.27	-	-
MI score	5.81	-11.64	-	-
26.	**Collocation**	**Non-Collocation**	**Filler**	**Non-Word**
	follow instructions	seem instructions	reject enthusiasm	escape bleighth
Frequency of the Node	58,483 520.26 per million	59,618 530.67 per million	-	-
t-score	3.76	-113.59	-	-
MI score	5.78	-11.81	-	-
27.	**Collocation**	**Non-Collocation**	**Filler**	**Non-Word**
	give evidence	think evidence	tear mountain	stir greighth
Frequency of the Node	129,248 1,150.45 per million	146,620 1,305.08 per million	-	-
t-score	8.89	-1021.56	-	-
MI score	5.77	-14.97	-	-
28.	**Collocation**	**Non-Collocation**	**Filler**	**Non-Word**
	use resources	look resources	force fortune	tend sprirque
Frequency of the Node	124,366 1,106.99 per million	104,995 934.57 per million	-	-
t-score	2.85	-427.02	-	-
MI score	4.30	-13.72	-	-
29.	**Collocation**	**Non-Collocation**	**Filler**	**Non-Word**
	require knowledge	appear knowledge	achieve agreement	succeed scroarse
Frequency of the Node	29,284 260.66 per million	29,805 265.3 per million	-	-
t-score	8.41	-141.11	-	-
MI score	4.39	-12.12	-	-
30.	**Collocation**	**Non-Collocation**	**Filler**	**Non-Word**
	cover area	wish area	swear frame	remind jait
Frequency of the Node	19,610 174.55 per million	16,317 145.24 per million	-	-
t-score	9.13	-311.17	-	-
MI score	4.39	-13.26	-	-

Appendix 4: (Continue)

31.	Collocation	Non-Collocation	Filler	Non-Word
	develop argument	remain argument	regard laughter	tremble phloathe
Frequency of the Node	27,227 242.35 per million	30,740 273.62 per million	-	-
t-score	3.75	-121.46	-	-
MI score	4.87	-11.90	-	-
32.	Collocation	Non-Collocation	Filler	Non-Word
	support argument	introduce argument	squeeze invasion	approve phrourth
Frequency of the Node	17,936 159.65 per million	14,197 127.26 per million	-	-
t-score	7.63	-56.07	-	-
MI score	5.02	-10.79	-	-
33.	Collocation	Non-Collocation	Filler	Non-Word
	present evidence	manage evidence	confirm heaven	destroy clorch
Frequency of the Node	14,391 128.1 per million	14,358 127.8 per million	-	-
t-score	7.98	-100.01	-	-
MI score	4.66	-11.62	-	-
34.	Collocation	Non-Collocation	Filler	Non-Word
	explore issue	invest issue	calculate hero	consist nilch
Frequency of the Node	4,766 42.42 per million	3,610 32.13 per million	-	-
t-score	6.41	-0.0005	-	-
MI score	4.90	-0.02	-	-

CURRICULUM VITAE

Ahmet AKTÜRK was born in Gümüşhane in 1990. He graduated from Mareşal Çakmak Anatolian Teacher High School in 2008. He completed his undergraduate education on English Language Teaching at Marmara University in 2012. Then, he worked as an English teacher in the Ministry of National Education for three years. He started studying Applied Linguistics for a Master of Arts degree at Karadeniz Technical University in 2017. Currently, he works as an instructor in the Department of Foreign Languages at Gümüşhane University.

AKTÜRK is single and he can speak English as a foreign language.