YEDİTEPE UNIVERSITY
INSTITUTE OF EDUCATIONAL SCIENCES
DEGREE OF DOCTOR OF PHILOSOPHY IN ENGLISH LANGUAGE EDUCATION

THE ROLE OF MORPHOLOGICAL PROCESSING IN READING FLUENCY IN THE SECOND LANGUAGE

MUTAHHAR BAŞER

2017

YEDİTEPE ÜNİVERSİTESİ
EĞİTİM BİLİMLERİ ENSTİTÜSÜ MÜDÜRLÜĞÜ

TEZ TESLİM ve ONAY TUTANAĞI

KONU: THE ROLE OF MORPHOLOGICAL PROCESSING IN READING FLUENCY IN THE SECOND LANGUAGE

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TESLİM EDEN : MUTAHHAR BAŞER
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ACKNOWLEDGEMENTS

I would like to express my sincere gratitude to my supervisor Prof. Ayse Gürel. She guided and helped me to find this relatively less studied subject and encouraged me to pursue my interest in psycholinguistics and morphological processing. I would not have acquired enough knowledge about morphological processing if she had not accepted me to her Mental Lexicon course. She always gave constructive feedback after reading each part of my dissertation. The academic quality of my dissertation would not have been at this level without her supervision.

I would like to thank Prof. Ayşe Akyel who has supported me since the beginning of the day I applied for the PhD program in English Language Teaching at Yeditepe University. She always motivated me to carry out my responsibilities and to achieve my goals. She also taught me how to think critically. I would not have been able to complete the doctoral program without her support and encouragement. I would like to thank Associate Professor Hossein Farhady for his advice on the design and the statistical analysis of the research. I also would like to thank my dissertation committee members Assistant Professor Aysun Kunduracı and Assistant Professor Adem Soruç. I owe thanks to Serkan Uygun for his help to do statistical analysis, and Sinan Nişancı for editing my work.

I must also thank the members of the Department of English Language Education especially Assistant Prof. Zeynep Banu Koçoğlu and the research assistants of the department for providing help whenever I needed.

My wife Kevser deserves big thanks for encouraging me to start the PhD program and motivating me to finish the program. My special thanks goes to my daughter Selin and my son Okan for their understanding when I did not spend time with them and studied instead.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

ANOVA	Analysis of Variance
CAUS	Causative
CEFR	The Common European Framework of Reference for Languages
D/P	Declarative Procedural
EFL	English as a Foreign Language
ELT	English Language Teaching
IMPF	Imperfective
INT	Interrogative
L1	First Language
L2	Second Language
NEG	Negation
OQPT	The Oxford Quick Placement Test
PASS	Passive
P.COP	Past Copula
PL	Plural
PSB	Possibility
REC	Reciprocal
RT	Reaction Time
SAT	Scholastic Aptitude Test
SD	Standard Deviation
SOA	Stimulus Onset Asynchrony
SPSS	Statistical Package for the Social Sciences

ABSTRACT

The Role of Morphological Processing in Reading Fluency in the Second Language

The present study investigates a potential link between morphological processing patterns and reading fluency in second language (L2) English. To this end, the L2 processing of derivational morphology is examined in first language (L1) Turkish-speaking learners of L2 English (i.e., Turkish EFL learners). More specifically, the online processing of derived words both in L1 Turkish and L2 English was examined via two masked priming lexical decision experiments. The target derivational suffixes were *–lI* and *–sIz* in Turkish and *–ful* and *–less* in English. The reaction times (RTs) obtained through two masked priming tasks were compared within two groups of Turkish EFL learners who had pre-intermediate and upper-intermediate proficiency levels. A group of English native speakers also participated in the study as a control group. L2 English learners' L1 Turkish processing patterns were examined to understand whether L1 processing patterns were also applied to L2 processing. Findings revealed that L2 English learners demonstrated full priming effects in processing of both L1 Turkish and L2 English derivational morphology. In other words, L2 learners employed decomposition in accessing derived words. No significant differences were found between pre-intermediate and upper-intermediate-level L2 participants in processing English and Turkish multimorphemic words. On the other hand, native speakers of English showed repetition priming while processing derived words in their L1 English. In other words, accessing bare target forms was facilitated only after identical primes. As for reading fluency, native English speakers outperformed both L2 groups. Nevertheless, the reading fluency scores and the morphological processing patterns did not reveal any correlation except for the priming pattern for the derivational suffix *–ful* in the pre-intermediate group. This suggests that morphological processing pattern may not have a direct effect on reading fluency. The findings of the study also imply that the L2 proficiency level does not lead to any qualitative differences in L2 learners' morphological processing patterns. The full priming pattern (i.e. decompositional processing route) observed in the learners' L1 Turkish and L2 English could be attributed to the agglutinative morphology of Turkish. In other words, L2 learners may employ decompositional route in the L2 due to the morphological system in their L1 Turkish, suggesting L1 influence on L2 processing. The role of early L2 English exposure and morphological awareness raising in morphological processing as well as in reading fluency should be investigated in future studies.

Key Words: Morphological processing, second language learning, masked priming, visual lexical decision, reading fluency.

KISA ÖZET

Biçimbirimsel İşlemlemenin İkinci Dilde Okuma Akıcılığı Üzerine Etkisi

Bu çalışma ikinci dil (D2) İngilizcede biçimbirimsel işlemleme örüntüleri ile okuma akıcılığı arasındaki olası ilişkiyi araştırmaktadır. Bu amaç doğrultusunda, İngilizceyi yabancı dil olarak öğrenen ve ana dil (D1) olarak Türkçe konuşan kişilerde İngilizce (D2) türemiş sözcüklerin biçimbirimsel işlemlenmesi incelenmiştir. Türemiş sözcüklerin çevrim içi işlemlenmesi, maskelenmiş çağrıştırma tekniğiyle sözcük tanıma testi aracılığıyla hem D1 Türkçe hem de D2 İngilizce için incelenmiştir. Araştırılması hedeflenen çekim ekleri Türkçede *–lI* ve *–sIz*, İngilizcede ise *–ful* ve *–less* ekleri olmuştur. Maskelenmiş çağrıştırma tekniği ile sözcük tanıma testinden elde edilen tepki verme (sözcük tanıma) süreleri, orta ve orta üstü yeti düzeyinde İngilizce öğrenen iki grup Türk öğrenci ile İngiliz doğal konuşmacılar için karşılaştırılmıştır. İngilizceyi yabancı dil olarak öğrenen Türk öğrencilerin çok biçimbirimli sözcükleri nasıl işlemledikleri sorusunun sadece İngilizcede değil ana dilleri olan Türkçede de araştırılmasının nedeni ana dili işlemleme örüntülerinin yabancı dil işlemlenmesinde de uygulanıp uygulanmadığını anlayabilmektir. İngilizceyi yabancı dil olarak öğrenenler, kendi ana dilleri Türkçedeki biçimbirimleri işlemlerken tam çağrışım sergilemiş (başka bir deyişle, biçimbirimsel ayrıştırma yapmış) ve benzer bir durum yabancı dil İngilizcede de gerçekleşmiştir. Orta ve orta üstü seviyedeki katılımcıların İngilizce sözcükleri işlemlemelerinde bir fark tespit edilmemiştir. Dikkate değer bir şekilde, İngiliz doğal konuşmacılar türemiş İngilizce sözcükleri işlemlerken sadece birbirinin tekrarı olan sözcükler için çağrışım göstermiş, çok biçimbirimli sözcükler içinse çağrışım eğilimi göstermişlerdir. Başka bir deyişle, yalın haldeki hedef sözcükleri tanıma hızı sadece hedef sözcüklerle aynı olan çağrıştırıcılar sonrasında kısalmıştır. Okuma akıcılığı yönünden ise İngilizceyi anadil olarak konuşan katılımcılar, İngilizceyi yabancı dil olarak öğrenen iki gruptan daha üstün performans göstermiştir. Ancak katılımcıların okuma akıcılığı ile biçimbirimsel işlemleme örüntüleri arasında bir ilgileşim bulunmamıştır. Bundaki tek istisna, orta seviyedeki grubun İngilizce türetim eki *–ful* için elde ettiği çağrışım sonuçları ile okuma akıcılığı sonuçları arasında gösterdiği ilgileşimdir. Bu bulgular biçimbirimsel işlemleme örüntüsü ile okuma akıcılığı üzerine her hangi bir direk bağlantı olmadığını düşündürmektedir. Çalışmanın bulguları, yabancı dil yetkinlik seviyesinin yabancı dil biçimbirimsel işlemleme örüntüsünde her hangi bir niteliksel değişikliğe neden olmadığına işaret etmektedir. Türkçe ve İngilizce çok biçimbirimli sözcükler için gözlemlenen tam çağrışım (türemiş sözcükleri biçimbirimlerine ayırarak işlemleme) sondan eklemeli bir dil olan ana dil Türkçenin ikinci dil İngilizce üzerine etkisi olarak değerlendirilebilir. Bundan sonra yapılacak çalışmalarda, ikinci dil olarak İngilizceye erken başlamanın ve öğrencilerde biçimbirimsel farkındalık geliştirmenin, biçimbirimsel işlemleme ve okuma akıcılığı üzerine etkilerinin araştırılması önerilmektedir.

Anahtar Sözcükler: Biçimbirimsel işlemleme, ikinci dil öğrenme, maskelenmiş çağrışım, görsel sözcük tanıma, okuma akıcılığı

CHAPTER 1

INTRODUCTION

Since the invention of writing, reading has been indispensable in the life of human beings. It is almost impossible to spend a single day without reading. The things that we read vary from the labels on a bus to a best-seller book or from a headline on a newspaper to an academic article written for scientific purposes. Irrespective of what we read or for what purpose we read, our mind undergoes a psycholinguistic process involving many different cognitive and linguistic operations such as letter identification (i.e. letter decoding) and message interpretation.

The process of learning to read in the first years of the primary school is initially slow and difficult. Nevertheless, the process becomes easier and faster as we achieve automaticity in different components of a reading task starting from an initial letter identification stage to a subsequent higher–level skills that involve the recognition and interpretation of words, phrases, clauses and sentences. There has been much research on how the human mind accomplishes this complex task (Koda, 2007; Perfetti, Landi, & Oakhil, 2005, Perfetti, 2007; Perfetti, Yang, & Schmalhofer, 2008).

Psycholinguistic studies on visual word recognition/processing have direct relevance to research on reading as these two lines of research can complement each other to answer many intricate questions. Word recognition research has so far focused on several issues such as the processing of morpho-phonological units, pattern recognition, memory as well as the automatic and attentional aspects involved in these processes. Attentional and automatic processes have been the major locus of word recognition research as there is a "natural relationship between the development of reading skills and the development of automaticity" (Balota, Yap, & Cortese, 2006, p. 286.)

The way morphologically complex words are processed has been a subject of psycholinguistic studies. Although morphology is said to have an important role in how words are stored in the lexicon, its role in the storage and processing of complex words is not completely understood despite much research on different languages.

In psycholinguistic research on word recognition, different experimental methods have been used to identify how words are stored (organized) and accessed/recognized in the mental lexicon. Simple (unprimed) lexical decision experiments were mainly used for this purpose until priming experiments were developed by Forster & Davis (1984). Simple lexical decision and priming paradigms have revealed much about the role of morphemes in visual word recognition. This line of research has mainly focused on the question of whether multimorphemic words are represented via decomposition (i.e. morpheme-based analysis) or full-listing (i.e. chunk representation) (see Marslen Wilson, 2007 for a review).

Another body of research investigating the role of morphemes in word recognition and learning has been concerned with a potential link between morpheme awareness and reading comprehension of primary school students (Carlisle, 2003a; Carlisle & Fleming, 2003; Keiffer & Lesaux, 2008; Singson, Mahony, & Mann, 2000). Studies on this have mainly used traditional pen-and-paper tests to examine the development of students' awareness and metalinguistic knowledge of different types of morphemes. Nevertheless, a variety of online methods in the field of psycholinguistics is now widely available and can be used to complement research exploring the development of reading in relation to morphological awareness. In other words, time-sensitive measurements of comprehension and production latencies as used in the mental lexicon research would also be revealing for reading research as they would enable us to understand "how linguistic representations are constructed in real time during language comprehension and production and how to reduce the possibility of participants relying on their explicit or metalinguistic knowledge, compared to the more commonly used offline tasks" (Clahsen et al., 2010. p. 23).

This dissertation aims to relate the patterns of morphological processing of derived words to reading fluency in adolescent L1 Turkish-speaking learners of L2 English, who have learned English in EFL school settings. In this respect, the current study aims to merge two fields, namely psycholinguistics and reading in the L2 by using both online psycholinguistic experiments and offline reading fluency test. Thus, the study will enable us to answer the question of how multimorphemic L1 and L2 derived words are processed and stored in the mental lexicon of adolescent L2 learners of English and whether the processing pattern they demonstrate is related to their reading fluency. The study, thus, could provide English language teachers and learners with new insights from the field of psycholinguistics into L2 reading development.

1.1 Significance

Most of the previous morphological processing studies (Butterworth, 1983; Fraunfelder & Schreuder, 1991; Gürel, 1999; Kırkıcı & Clahsen, 2013; Kim, Wang, & Ko, 2011; Marslen Wilson, 2007; Rastle K. , Davis, Marslen-Wilson, & Tyler, 2000; Silva & Clahsen, 2008; Taft & Forster, 1975) focused on whether multimorphemic words are stored and processed in a decomposed form or as whole words. In the early phases of morphological processing studies, basic simple lexical decision tasks were used, and decisions were made according to the difference between the mean RTs of various word lists which were manipulated in line with the research questions. For example, a typical question examined in this paradigm was whether morphologically complex forms are processed more slowly than length- and frequency-matched simple (i.e. monomorphemic) words. In more recent research, priming techniques have widely been used to identify more closely the complex organization of words in the mental lexicon. The basic difference between the simple lexical decision and the priming paradigm is that unlike the former, the latter design involves different prime words (phonologically, orthographically, morphologically or semantically-related) that were presented very briefly (for about 40-60 milliseconds or longer) before the targets. Researchers were able to examine a variety of issues via the priming paradigm. For example, the question of how morphologically complex words (both derived and inflected) are stored and processed in monolinguals and bilinguals has been examined extensively (e.g., Clahsen et al. 2010 for a review). One of the most commonly used priming technique is called "masked priming technique" in which primes are presented very briefly to ensure that participants do not have sufficient time to consciously activate priming words before they make a lexical decision on target words (Fernandez & Cairns, 2011). It is assumed that this paradigm taps unconscious processing in participants. Lexical decision times (or reaction times) (i.e. RTs) to target words preceded by different primes are compared to the baseline condition, which is normally the identity prime (the same prime as the target word) to explore whether different types of primes facilitate, to differing extent, the recognition of certain target words.

The role of morphemes in word recognition, especially that of inflectional morphemes has been widely researched and discussed in L2 studies (Gor, 2010). However, the L2 processing pattern for derivational morphemes is relatively less researched.

Nevertheless, the processing of derived words in the L2 could be very informative as to understand potential processing differences between native and non-native speakers and to identify a potential link between the activation of derivational morphemes and L2 reading. Therefore, comparing the morphological processing pattern of native and non-native speakers is necessary in order to understand how L2 learners process their L2. Available morphological processing data in L1 and L2 Turkish is limited (Gürel, 1999; Gürel & Uygun, 2013; Kırkıcı & Clahsen, 2013; Uygun, 2016). As will be discussed later, although Kırkıcı and Clahsen's 2013 study compared derivational (*-lık* nominalizer) and inflectional morpheme (the aorist *–I/Ar*) in Turkish, to my knowledge there is not any other study comparing Turkish speakers' processing of derivational morphology in L1 Turkish and L2 English at the same time.

Furthermore, the present study will contribute to online morphological studies both in the context of L1 and L2 by providing data from Turkish —a relatively understudied language. Indeed, most research in this area has been carried out with Indo-European languages. Thus, more studies with non-Indo-European languages are required (Libben & Jarema, 2002). Furthermore, given the agglutinative nature of Turkish morphology, processing data from Turkish will be rather revealing to test psycholinguistic models and theories which are mostly based on data from Indo-European languages such as English and German. In addition, the present study will contribute to bilingualism research by providing data from L2 learners' morphological processing not only from their L2 but also from their L1 (see also the processing study of Uygun, 2016). Since most L2 processing research does not include L1 processing patterns, the present study will enable us to compare L1 and L2 processing of the same participants. Furthermore, since the study involves two proficiency groups, it will also provide insights into the question of whether the pattern of L2 processing of morphology changes as a function of L2 proficiency.

Crucially, to my knowledge this is the first study examining potential links between L2 reading fluency and L2 processing of complex English words. The findings will have pedagogical implications for teaching L2 learners how to process morphologically complex words and to develop fluency in L2 reading. On this note, it is important to note again that unlike previous morphological awareness studies involving offline metalinguistic tasks; this study is based on an online masked priming experiment in an investigation searching for links between the mental representation of L2 morphology and L2 reading. More specifically, to my knowledge, only Jeon (2011) tried to examine the unique contribution of morphological awareness to reading comprehension in the L2 and no other study has investigated the relationship between morphological processing and reading fluency or sentence level reading comprehension or fluency. Therefore, to my knowledge this dissertation will be the first to compare the role of the L1 and the L2 morphological processing on the L2 reading fluency and sentence level reading comprehension.

To sum up, this study will be one of the few studies connecting two research areas, morphological processing and L2 reading. It will also be unique as it attempts to relate real time morphological processing patterns of multimorphemic derived words to L2 reading fluency.

1.2 Research Questions and Predictions

The present study investigates the morphological processing patterns of adolescent Turkish native speakers learning L2 English in the domain of derivational morphology. Participants' processing patterns are examined both in their L1 Turkish and L2 English to compare potential processing differences (and potential L1 transfer effects) between the L1 and the L2. To examine the proficiency effects, data were collected from two groups of L2 learners (i.e. pre-intermediate and upper-intermediate level learners). The study also aims to explore potential correlations between morphological processing and L2 reading fluency.

The first part of the study aims to identify the morphological processing patterns of L2 English learners both in their L1 Turkish and L2 English. The L2 learners' morphological processing patterns are also compared to those of native speakers of English. This part of the study will enable us to identify whether native-like processing is possible in late L2 English learners. The second part of the study attempts to relate the findings of morphological processing experiments to reading fluency scores of L2 learners of English. With this regard, the specific research questions that are being answered in this PhD dissertation are as follows:

1. How do pre-intermediate and upper-intermediate-level L2 learners of English process derived words in L2 English and L1 Turkish?
2. Is there a difference among English native speakers, pre-intermediate and upper-intermediate-level L2 English learners in terms of the processing pattern they employ in the context of derivational suffixes?

3. Does the way L2 learners process multimorphemic words with derivational suffixes relate to L2 reading fluency independent of their proficiency levels?

The predictions for the research questions are as follow:

It is predicted that both pre-intermediate and upper-intermediate L2 learners of English will decompose multimorphemic words in L2 English. In other words, they will demonstrate full priming (i.e. facilitation effects) while accessing target words presented visually right after morphologically-related primes. This prediction is based on the findings of previous studies such as Diependaele et al. (2011), and Silva & Clahsen (2008), who observed priming effects in the processing of derived words. The priming effects observed in these studies suggested that unlike inflected complex words, decomposition of derived words in L2 English is possible for late L2 learners from different L1 backgrounds such as German, Chinese, Japanese, Spanish and Dutch. Thus, a similar result is predicted in L1 Turkish-L2 English learners.

The studies noted above were carried out with adult L2 learners, and the role of L2 proficiency was not their direct focus. Therefore, the role of L2 proficiency in morphological processing has not been clearly established. In the present study, I predict that although there may be some quantitative differences between the pre-intermediate and upper-intermediate level participants in terms of RTs, both groups are predicted to show decomposition in processing L2 English multimorphemic words. In other words, despite RT differences, both L2 groups will demonstrate the same pattern of processing. Among the three participant groups; native speakers are anticipated to react the fastest (i.e. show shorter RTs in recognizing target words) in the masked priming experiment. As it will be discussed in the methodology section, potential differences in the mean RTs among the identical, test and unrelated prime conditions will reveal whether there is decomposition or whole word recognition in processing multimorphemic words. With respect to participants' L1 Turkish processing, both groups are expected to demonstrate decomposition in processing Turkish derived words. My prediction is in accordance with findings of the masked priming experiments carried out by Kırkıcı & Clahsen (2013), who reported that Turkish native speakers process complex Turkish words (both inflected and derived) in a decomposed fashion. In addition, similar L1 studies carried out in different languages such as English (Silva & Clahsen, 2008; Diependaele et al., 2011) and German (Clahsen & Neubauer, 2010) revealed priming effects for multimorphemic derived words. Likewise, I predict that L1 Turkish speakers will show full priming effects in processing multimorphemic derived words in Turkish. Thus, the decompositional pattern that I expect to find in L1 Turkish is going to be observed in their L2 English as well.

The second research question aims to find whether there is difference between native and non-native speakers of English. As noted earlier, the non-native group involves participants at two different proficiency levels. The study examines potential differences among these three groups in terms of the processing pattern they employ in the context of derivational suffixes. As for this research question, I do not expect to find a significant qualitative difference between native speakers and L2 English learners in terms of morphological processing of derived words. Only slight quantitative differences might be observed with regard to RTs and the magnitude of priming. In other words, L2 learners, particularly those with pre-intermediate L2 proficiency may be slower than native speakers of English and upper-intermediate participants. Previous research showed similar morphological processing patterns in advanced L2 learners and native speakers for derived words (Kırkıcı & Clahsen, 2013). I expect to find such similarity in the current study between the higher proficiency L2 learners and native speakers of English. Thus, the upper-intermediate group, due mainly to the proficiency level and length of exposure to language effects, could show a processing pattern that is more comparable to that of native speakers of English.

To sum up, it is predicted that L2 learners of English, like native speakers of English, will demonstrate a decompositional pattern in the processing of derived words in English. Although overall, the native speaker group is expected to be faster than the two L2 groups, and the upper-intermediate group will be faster than the pre-intermediate group, the three groups will not differ significantly from one another in terms of the decompositional pattern of word recognition. Crucially, the same decompositional pattern is predicted in L1 Turkish of the same L2 participants. A summary of the predictions is presented in Table 1.

Table 1.

Summary of the predictions for the morphological processing in the L1 and L2

PARTICIPANTS	ENGLISH	TURKISH
Native Speakers of English	Fastest RTs and full priming effect are anticipated.	N/A
Pre-Intermediate L2 English Group	Relatively slower RTs are anticipated. Full priming is anticipated but the priming effect will not be as strong as it would be for the upper-intermediate group and native English speakers.	Slower RTs and priming of a lesser magnitude are anticipated
Upper-Intermediate L2 English Group	RTs are predicted to be faster than the pre-intermediate group but slower than native speakers, and full priming is anticipated.	Fast RTs and strong priming are anticipated

With respect to the potential relationship between the processing of morphologically complex words and reading fluency in the L2, I predict that the native speakers of English (i.e. the control group) will outperform non-native groups with regard to reading speed. The native speakers are expected to be followed by the upper-intermediate group. As for the relationship between L2 morphological processing and L2 reading, it is important to note that a morpheme-based decompositional processing pattern, as may be revealed by the masked priming paradigm, is normally taken to be a sign of implicit linguistic computation (Clahsen et al. 2010). In other words, it has been suggested that native speakers can accomplish unconscious linguistic decomposition but this ability is not always guaranteed in late L2 learners. On the basis of this, I predict that an ability to do online and unconscious decomposition of derived words (or inflected words, for that matter) should also correlate with increased sensitivity and automatization of constituent morphemes in a complex word as reflected by increased reading fluency. Thus, the strength of the decompositional pattern is expected to correlate with faster reading.

1.3 Limitations

As a first limitation in the study, I can note that the study only involved a native English speaker group as the control group but there was no native Turkish speaker group. Since the study compared the participants L1 and L2 processing, it would have been better to also test a group of monolingual Turkish native speaker group as the baseline. However, since the focus of the study was English, this study did not include an extensive examination of how late bilingual participants processed complex words in L1 Turkish in comparison to monolingual L1 Turkish participants. Further research focusing on L1 Turkish may include this additional control group.

One of the difficulties with interlanguage studies is about finding the right participants who have similar characteristics and qualifications in the language(s) under investigation.. By the same token, the native English speakers who participated in this study were from a wide range of socio-economic backgrounds and their mean age was higher than that of L2 English learners in this research.

Furthermore, the present study aimed to identify the morphological processing pattern of L2 learners in their native and target language by comparing the RTs for accessing multimorphemic words. However, only two different derivational suffixes in each language (Turkish and English) were tested. Given that there are more than 40 derivational suffixes in Turkish (Ergin, 2011), the results of this study should be taken with caution considering the generalizability problem. Nevertheless, no research study can be expected to test all the available morphemes in a language.

Another limitation of this study is related to the reading fluency test, which was based on sentence level silent reading. As a result, the prosodic features of reading were not taken into consideration while testing reading fluency. Nevertheless, given that the morphological processing study is based on visual word recognition, it is not unusual to test silent reading fluency only. Future research can consider developing tests of different modality.

1.4 Definition of Some Terms

In the psycholinguistic studies of morphology, various terms such as *decomposition, parsing, segmentation* and *computation* are used to describe the process by which a multimorphemic or complex word is separated into its constituent morphemes.

These terms are used interchangeably in this dissertation, yet the term which is used most frequently is “decomposition”. To refer to the opposite of decompositional process, the terms “full listing” or the “whole word representation” are used. These processes involve representing complex words without constituent morpheme segmentation.

The term ‘lexical decision task’ is used to refer to a psycholinguistic experiment in which participants are asked to decide whether or not a given string of letters represents a real word in a given language. Lexical decision tasks are generally based on recognition of printed words (Katz et al., 2011). It is one of the major tools used to investigate how identification of words is affected by such factors as morphological form of the word, its semantics and lexical neighborhood.

The term ‘primed lexical decision’ on the other hand, refers to a lexical decision task in which participants are shown a priming word before the target word. The prime word could be identical to the target word or it could be semantically, morphologically, phonologically, and orthographically related or completely unrelated to the target.

CHAPTER 2

REVIEW OF LITERATURE

In this chapter, brief information is presented about the psycholinguistic phenomena such as morphological processing, morphological awareness as well as reading fluency and the relationship between morphological awareness and reading fluency. In addition, previous studies carried out on these topics are presented in relation to the purpose of this dissertation.

2.1 Morphology and Morphemes

Morphemes are described as the smallest meaning bearing units that are used in word formation in a language. They are indivisible units and typically have either meaning or grammatical function (Balcı, 2011). They serve as phonological, orthographic, and semantic/syntactic units. Since morphemes are thought to be playing a functional role in word recognition due to the generative nature of the language, they have received considerable attention in the word recognition literature. In what follows, a brief note on the two different categorizations of bound morphemes (namely inflectional and derivational morphemes) is presented.

2.1.1 Inflectional Morphology

The dissertation study merely discusses the processing of derivational morphology. Nevertheless, it is necessary to provide a brief note on inflectional morphology because there is much psycholinguistic research on the mental representation of complex words involving inflectional affixes. This is because of the fact that inflectional morphemes mark syntactic features, such as tense agreement on verbs and number in nouns (e.g., Marslen-Wilson W. , Tyler, Waksler, & Older, 1994). Thus, psycholinguistic research on inflected words has always been very revealing to understand the structure of the mental lexicon in the human mind.

Inflectional morphology is concerned with variations in the forms of words related to the syntactic structures in which they occur (Seidenberg & Gonnerman, 2000). Words that contain inflectional affixes have forms and meanings that are fully predictable from the knowledge about the base and affix. Moreover, they do not change the meanings or the syntax of the base. They have primarily grammatical functions (Marslen-Wilson et al., 1994). More specifically, inflectional morphology is the combination of a stem with one or more inflectional affixes (Marslen-Wilson, 2007). Since the addition of inflectional affixes does not create new words, inflected forms of the words are not normally listed as a new lexical entry in dictionaries. Furthermore, neither the basic meaning nor the grammatical category of a word is changed with the addition of inflectional morphology to its stem. For example, when the plural making inflectional suffix *–s* is added to the noun *book*, it is still a noun, or when past tense making inflectional suffix *–ed* is added to the verb *play*, it is still a verb.

2.1.2 Derivational Morphology

Derivational morphemes change the meaning and often the syntactic class of the stem they attach to (Marslen-Wilson et al., 1994). In English, derivational morphology includes both prefixes (e.g., *re-*, *ex-*, *pre-*) that are added to the front of the stems and suffixes (e.g., *-less, -ful, -ness* etc.) that are added to the end of the stems (Marslen-Wilson et al., 1994).

The meaning and the syntactic class (grammatical category) of the word *help* changes when the derivational suffixes *–less* or *–ful* is added to it. After the addition of *–ful* or *–less* to the stem, the semantic meaning of the new lexical entry *helpful* or *helpless* can be guessed on the basis of its stem. These types of derivational affixes are called "class altering derivational affixes" (Koda, 2005). Some other derivational suffixes, however, maintain the grammatical category of the word when added to the stem. These affixes are referred to as "class maintaining affixes" (Koda, 2005). Both types of derivational affixes exist in Turkish. For instance, when *–lIk*, a noun-making suffix which can attach to an adjective or a noun, is added to an adjective like *zor* 'difficult', the grammatical category of the word is changed from adjective into a noun, *zorluk* 'difficulty' is derived. However, when the same suffix *-lIk* is added to a noun as in the word *kitap 'book'*, the derived form *kitaplık 'bookcase'* is formed with no change in the grammatical category of the base. However, the meaning changes from the word 'shoe' to a 'closet where shoes are kept or stored'. This transformation is transparent and the meaning of the new entry can be guessed from the stem.

2.1.3 The Relevant Derivational Suffixes in Turkish

Turkish is an agglutinative language with rich inflectional and derivational systems. An example extracted from (Göksel & Keslake, 2007, p.48) illustrates the richness of Turkish morphemes.

Gör-üş-tür-ül-e-me-ye de bil-iyor mu-ydu-nuz?

see-REC-CAUS-PASS-PSB-NEG-PSB also PSB-IMPF INT-P.COP-2PL

‘Did it also sometimes happen that you were not allowed to see each other’

Similar examples of Turkish morphology can also be found in Bickel & Nichols (2007, p. 192).The two denominal nominal derivational suffixes used for this study are *–lI* and -*sIz* which can be considered as the Turkish counterparts of the English suffixes -*ful* and -*less*. The suffix *–lI* functions as a denominational suffix that derives adjectives out of nouns. The words derived with *–lI* can be used as both noun and adjective (Ergin, 2011). The traditional notation to represent these Turkish suffixes are *–lI* and *–sIz* with a vowel representing the high vowel (Göksel & Kerslake, 2005). Suffix *–lI* has four more allomorphs based on the Turkish phonotactics. These are *<lı>, <li>, <lu>, <lü>* (e.g., *boya, boya-lı* ‘paint, painted’; *ev, ev-li* ‘house’, ‘married’; *toz, toz-lu* ‘dust- dusty’ and *köy, köy-lü*. ‘village-villager’).

According to Kornfilt (1997, p. 446), the suffix *–lI* is attached to nouns to derive nouns and the meanings of the derived nouns fall into several categories. These categories are listed as:

a) having the object or quality expressed by the basic morpheme (e.g., *silah* ‘weapon’, *silahlı* ‘armed, armed person’)

b. Belonging to a place or institution (e.g., *üniversite* ‘university’, *üniversiteli* ‘person affiliated with a university or university student’

c. Dressed in garments of a particular color (when suffixed to the name of a color) (e.g., *beyaz* 'white', *beyaz-lı* 'person dressed in white') gives four different meanings (Kornfilt, 1997). On the other hand, Kunduracı (2013) demonstrates that suffixes *–sIz* and *–lI* can also be attached to the noun-noun compounds (e.g., *gül kokulu* 'having the smell of rose' or e.g., *gül kokusuz* 'without having the smell of rose'

The derivational suffix *-sIz* can be considered the opposite of the suffix *-lI*. It is also a denominal suffix which derives nouns or adjectives. Similar to the suffix *-lI*, depending on the vowel harmony rule its vowel may change based on the vowel of the stem it attaches to (E.g., *ağaç, ağaç-sız* 'tree, without tree'; *ev, ev-siz*, 'homeless' *tuz, tuz-suz* 'salt, without salt', *süt, süt-süz* 'milk- without milk'.

Kornfilt (1997) notes that the suffix *–sIz* is also attached to pronouns as well as nouns with a meaning of 'without'. It is the counterpart of the suffix *–less* in English. (e.g., *diş* 'tooth', *diş-siz* 'toothless, toothless person') With regard to their frequencies, derivational suffix *–lI* has a similar frequency to that of inflectional suffixes. Pierce (1960) presents the frequency of the Turkish suffix *–lI* as 842, whereas the frequency of *-sIz* is reported to be 143 out of one million.

2.1.4 English Derivational Morphemes

When English is compared with the other European languages such as German and French, the number of its inflectional affixes is few, yet in terms of its derivational resources it is at least as rich as German and French (Carstairs-McCarthy, 2002). These derivational suffixes are listed under various categories according to their word forms from which it is derived to which word form.

English derivational suffixes are listed based on their lexical categories as nouns derived from nouns (e.g. book - book-let), adverbs derived from adjectives (e.g. slow – slow-ly), nouns derived from verbs (e.g. paint - paint-er), verbs derived from members of other word classes (e.g. beautify, debug), adjectives derived from members of other word classes (e.g. suffixes -ed, -en and -ing,), adjectives derived from adjectives (e.g. legal - illegal), nouns derived from nouns (mother – mother-hood) and nouns derived from members of other word classes (e.g. pure-purity, perform – performance). Based on this typology, the suffixes *–ful* and *–less* are listed under the category of suffixes that form adjectives from nouns, together with two other suffixes *–al* and *–ish* (Carstairs-McCarthy, 2002, p.53)

The derivational suffixes *–ful* and *–less* are considered being productive and frequent, yet there is a slight frequency difference between them as illustrated by Nation (2005). He categorized the frequencies of suffixes into five stages from the most to the least frequent. According to this list, the derivational suffix *–less* is at the top stage the suffix *–ful* is listed in the second. Based on this list, it can be said that both *–ful* and *–less* are frequent morphemes, but *–less* is more frequent than *–ful*.

2.2 The Mental Lexicon and Morphological Processing Models

The mental lexicon is broadly defined as an abstract mental dictionary which is believed to package together all of the orthographic, semantic and phonological information about known words (Rastle, 2007). The 'dictionary' metaphor is very commonly used for describing the mental lexicon. Although they involve different organizations, the mental lexicon, like a dictionary, contains information (e.g., spelling, part of speech, pronunciation and meaning) about words.

Libben and Jarema (2002) note that one can examine the role of storage and computation on accessing words by exploring the mental lexicon in the mind. In addition, we can also correlate psychological and neural activities, and examine how the properties of languages, populations, and tasks interact. With regard to this idea, the researchers have examined the state of multimorphemic words in the mental lexicon. Usually the research questions have focused on whether multimorphemic words (derived or in inflected word forms) are stored and processed as bare forms unattached from the morphemes or as a chunk. To reinforce the importance of morphological processing studies, Libben and Jarema (2002) argue that the understanding of the nature and extent of morphological processing is critical to the overall investigation of how words are organized in the mind. They conceptualize the lexicon as the "backbone of language ability" (Libben & Jarema, 2002, p. 2).

From a broader perspective, the mental lexicon is defined as "the cognitive system that constitutes the capacity for conscious and unconscious lexical activity" (Libben & Jarema, 2007, p. 2). In this definition the mental lexicon is described as a "system" because no matter whether words are represented in a similar way in the mind or not, they are linked to one another. The word "capacity" is used to draw attention to the point that the lexical component of our language changes over our lifespan, and it extends with the acquisition of new words. Therefore, the mental lexicon is not fixed; rather it is dynamic and changing.

Since there are still many questions about how the mental lexicon is organized and how these words are stored, the focus of this study will be on how multimorphemic words are processed and stored in our mental lexicon.

2.3 Morphological Processing Models

On the basis of available data, various morphological processing models have been proposed in the morphological processing literature. In the following section, a discussion of these morphological processing models is presented.

The main question in the morphological processing literature has been whether multimorphemic words are represented in the mental lexicon as separate entries with their stem and affixes in a combined whole or whether they are represented in a morphologically decomposed fashion. There are two main models on this question: the Decomposition Model proposed by Taft & Forster (1975) and Taft (1988), and the Full Listing Model proposed by Butterworth (1983).

The Decomposition Model proposes that a multimorphemic word (derived or inflected) is separated into its constituent morphemes before lexical access. The constituent stems and affixes of a word are represented separately. For example the forms *smile*, *smiled*, *smiling* and *smiles* do not exist in the mental lexicon separately. Rather there is only one entry for the stem/root 'smile' in the lexicon and all other forms are produced or decoded by applying an affix attachment rule.

The Decomposition Model was first proposed by Taft & Forster (1975), who carried out a series of lexical decision experiments to support their model. In their first experiment they measured the RTs of multimorphemic words with real stems existing in the lexicon (e.g., re-juvenate) and non-existing pseudo-stems (e.g., re-pertoire) via a lexical decision task. The result of the experiment revealed that the multimorphemic words that had real stems took significantly longer to recognize than the words that had pseudo stems. In addition, more errors were made in real stem condition. Based on this result, Taft & Forster (1975) explained the longer reaction time of real stems as evidence for the decomposition process because it is thought that the prefixes are stripped off in both cases. In the real stem case, however, the search is interrupted by the finding of a lexical entry JUVENATE, which is necessary for the recognition of the word REJUVENATE. Therefore, the response time is slowed down. In the pseudo stem case, the search ends after the participant recognizes that it is not a real stem. Based on these findings, Taft and Forster (1975) concluded that affixes must be stripped off to recognize a morphologically complex word. This process is called ‘affix stripping’ (Taft and Forster, 1975).

Taft (1981) reinforced his decompositional model in subsequent experiments. Similar to the above mentioned one, he carried out several experiments with pseudo-prefixed words. The results revealed that pseudo-prefixed words were also decomposed. Taft (1981) suggests that such decomposition of pseudo-prefixed words would not occur if the affixed words were not decomposed.

In addition to early morphological decomposition research, several other studies provided evidence for decomposition of multimorphemic words before lexical access (Frost, Forster, & Deutsch, 1997; Longtin & Meunier, 2005; Rastle, Marslen Wilson and Tyler, 2000).

The Full Listing Model, on the other hand, proposes that no matter whether a word is simple or complex, it has an individual representation in the mental lexicon. In other words, a morphologically complex word is recognized as a single entity, not in a decomposed form of stem and affix. (Butterworth, 1983).

The model that assumes morphology-based decomposition is computationally costly because each time a complex word (derived or inflected) needs to be accessed, its stem and affixes need to undergo a computation (i.e. in language decoding, they need to be decomposed; in encoding they need to be composed). In the full-listing model however, since stems and affixes make up chunk representations, computationally, there is less cost; but storage-wise, it requires a huge storage capacity.

In addition to these two main models, there exist some hybrid models. The Augmented Address Morphology proposed by Caramazza, Laudanna & Romani (1988) is one of them. This model proposes that if the complex form is not familiar to the parser, the stem and affix are represented separately. Therefore, novel words are more likely to be parsed rather than accessed through a direct access route.

Another model is the Morphological Race Model proposed by Baayen, Dijkstra, & Schreuder (1997) and Fraunfelder & Schreuder (1991) that proposes that the direct access and decomposition routes are in competition. Transparency and frequency are the two key concepts in the aforementioned competition. Ease of lexical processing is thought to be particularly influenced by the frequency in most hybrid models of the mental lexicon. In general, high frequency words are recognized more easily than less frequent words (Brysbaert, Lange, & Van Wijnendaele, 2000). On this note, it is also important that the frequency of stem, stem-affix combination (whole word frequency) and the affix frequency are relevant (Taft, 2004). In general, frequency dissimilarities are considered to explain why one form is easier to recognize or takes less time to retrieve than the other in language acquisition and processing research (Taft, 2004; Clahsen & Neubauer, 2010).

In their study Ford, Davis, & Marslen-Wilson (2010) investigated the morpheme frequency effects for derived words. They examined the influence of the frequency of the base such as *dark* on responses to complex derived forms such as *darkness*. Morpheme frequency effects have been interpreted as evidence of morphemic representation. In their visual lexical decision experiments, they compared the effect of the base morpheme frequency and family size on response times to derived words in English. The results of the experiments revealed that "base morpheme frequency and family size were independent predictors of response times to derived words" (p. 117). It is important to note that besides frequency, there are other factors that make an impact on the extent of decomposition in online word recognition. For example, word formation type (inflection or derivation), productivity of the affix, and affix homonymy are also found to be important (Bertram, Schreuder, & Baayen, 2000).

2.3.1 The Priming Paradigm Used in Morphological Processing Research

Priming is defined as a term that refers to the phenomenon in which prior exposure to specific language forms or meanings either facilitates or interferes with a speaker's subsequent language comprehension or production (Trofimovich & McDonough, 2011). It is considered to be an implicit process and little awareness occurs in this process. Priming is said to be used in almost all areas of psycholinguistics as it is considered to be one of the most popular experimental technique. Harley (2001, p. 17) describes priming with the words cited below:

> "The general idea is that if two things are similar to each other and involved in the same level of processing, they will either assist with or interfere with each other, but if they are unrelated, they will have no effect. For example, it is easier to recognize a word (e.g. BREAD) if you have just seen a word that is related in meaning (e.g. BUTTER). This effect is called semantic priming. If priming causes processing to be speeded up, we talk about facilitation; if priming causes it to be slowed down, we talk of inhibition."

Priming technique is used in implicit memory studies by memory researchers, (Feldman, 2009, p. 221). Priming methods are also one of the predominant experimental paradigms used in research on cognitive aspects of language learning and use. Although these methods originated in the field of theoretical psycholinguistics, they have become increasingly common in applied linguistics over the past two decades (Trofimovich and McDonough, 2011).

To answer the question of whether multimorphemic words are either parsed into their morphemes or processed through direct lexical access, simple lexical decision and particularly priming experiments have been used. In simple lexical decision experiments that examine the role of morphology in word recognition, the mean RT differences between different types of words (e.g.. morphologically complex words and length-and frequency-matched monomorphemic words) have been the focus of the studies, and the morphological processing type has been determined by looking at the RT differences between these variables (Cole, Segui, & Taft, 1997; Forster & Davis, 1984; Gürel, 1999; Hankamer, 1989).

Primed lexical decision tasks involve the presentation of a prime word before a target word. Participants are asked to perform a lexical decision task on a string of letters after a brief exposure to a prime word. They are asked to decide whether the given string of letters is a real word or a nonword. The semantic, phonological, orthographic or morphological relation between prime and target words is manipulated to examine the potential effects of these factors on participants' responses. In other words, depending on the research question, the prime word can be selected on the basis of its semantic, phonological, orthographic or morphological similarity to the target word. According to Forster (1999), priming occurs when the processing of a word (the target) is facilitated by a preceding stimulus (the prime). The representation of the prime automatically activates the representation of the target word because according to most common interpretation, the cortical representations of the prime and target are interconnected or overlap in some way. The question here is to identify the type of primes that would facilitate the recognition of target words most.

Prime words can be masked (i.e. the prime word is forward- or backward-masked between hash marks (######) and the target, and it is presented for a very short period of time around 40-60 ms.) or overtly (i.e. for more than 60 ms.) (Kırkıcı & Clahsen, 2013; Silva & Clahsen, 2008; see also the design in Kim et al. 2011). In masked priming experiments the time between the onset of the prime and the onset of the target is called "stimulus onset asynchrony" (SOA). This time is kept short in order to reduce the possibility of episodic memory effects or of any predictive strategies (Rastle et al., 2000). The short presentation time of the prime does not allow the participants to recognize the prime consciously. Short SOA prevents the facilitation of the orthographic overlap and the semantic link between the prime and the target; for target word recognition. When the priming word is displayed, the participants usually do not see anything other than a flicker on the computer screen. Thus, masked priming is thought to tap into an early pre-lexical stage of word recognition at which a prime word's form and morphological structure but not its semantic properties are accessible. Overt priming, by contrast, taps into processing occurring at a later stage of lexical processing at which the different semantic properties of these word pairs are recognized (Boudelaa & Marslen-Wilson, 2005; Clahsen et.al., 2013; Rastle & Davis, 2003; Rastle, Davis and New, 2004). In short, any priming effect found in a study cannot be attributed to the shared orthography or meaning between the prime and the target if SOA is kept short. For example, when priming is observed between the priming word *care* and the target word *careless* in a short SOA design, this priming effect cannot be ascribed to the fact that they share similar orthography or meaning because orthographic or semantic features of a prime word cannot be activated/accessed during such a brief time period. One of the benefits of the masked priming paradigm is that conscious strategic processes cannot be adopted by participants since it taps into automatic process (Wang, 2007).

2.3.2 L2 Studies Conducted on Processing of Derivational Morphology

The representation and the real-time processing of complex words have also become an important issue in the L2 acquisition literature. Some of the available L2 studies included only inflected words (Gürel, 1999; Neubauer & Clahsen, 2009), and some others included only derived words (Kim et al. 2011), yet a few examined both inflected and derived words and compared the processing of the two types of morphology (Kırkıcı & Clahsen, 2013; Kutlay, in preparation; Silva & Clahsen, 2008). The question of whether or not late L2 learners can process complex L2 words the same way as native speakers has been a central issue in this context (Clahsen, 2013; Clahsen et al. 2010). For example, Silva & Clahsen (2008) studied the morphological processing patterns for both inflectional (regular past tense form –ed) and derivational (de-adjectival nominalization with the suffixes –ness and –ity) morphemes with advanced Chinese, Japanese and German learners of English, and then compared the findings to those of L1 speakers of English. The results of the study revealed priming effects for both regular inflection and derived word forms in L1 English speakers. Only limited priming effects were detected for derivational suffixes with Chinese, Japanese and German-speaking L2 learners of English. Nevertheless, no priming effects were observed for inflectional morphology in any of the L2 groups. Based on these findings, the researchers concluded that L2 learners rely less on combinatorial processing (decomposition) than native speakers do in the processing of inflectional morphemes (Silva & Clahsen, 2008). In other words, L2 learners do not parse morphologically complex, inflected words. However, the same study observed partial priming effect for the L2 learners with regard to processing of derivational morphemes. This suggests that derivational morphemes are not processed like inflectional morphology by L2 English learners (Silva & Clahsen, 2008). Although priming effects were found for derivational morphology for L2 learners, it is not as strong as the priming effects found for native speakers of English. Therefore, it can be concluded that the processing of derivational morphemes of L2 is similar to L1 in contrast to the processing of inflectional morphology. To sum up, Silva & Clahsen (2008, p. 257) suggest that ‘‘L2 learners employ morphologically structured representations for derived word forms during processing, albeit less effectively than native speakers.’’ The results of the study showed that adult L2 learners rely more on lexical storage and less on decomposition of morphologically complex words than native speakers. These results are also consistent with Ullman’s

(2004; 2005) Declarative Procedural (DP) Model, which asserts that late L2 learners depend on their declarative memory rather than their procedural memory when processing L2 forms. On this note, Clahsen et al. (2010) claim that L1 and L2 processing is remarkably similar when lexical storage is the issue; however, L2 processing appears quite different when computation or decomposition is required. Ullman's (2004; 2005) The DP Model offers an account of L1-L2 processing differences. According to this model, idiosyncratic information must be memorized and stored as chunks in the mental lexicon, which is considered to depend on the declarative memory system. On the other hand, the mental grammar, in which combinatorial rules are included, depends on the procedural memory. The declarative system is believed to provide mechanisms to store and access whole-word representations. The procedural system, on the other hand, is claimed to provide mechanisms to acquire and use grammatical rules. This model precisely argues that maturational changes occurring during childhood/adolescence lead to the weakening of the procedural system and the development of the declarative system. As a result, L2 learning and processing are largely dependent upon the lexical memory system and necessitate grammatical computation to a much lesser extent in adult L2 learners compared to L1 speakers (Ullman, 2004). In line with this view, late L2 learners rely more on the whole word representation than decomposition when processing morphologically complex words (Clahsen et al., 2010).

Non-native-like morphological processing pattern was reported in another study which focused on the processing pattern of regular and irregular participles by adult native speakers of German and adult L2 learners of German with Polish as their native language (Neubauer & Clahsen. 2009). The result of the study revealed dissimilarities between L1 and L2 groups with regard to processing pattern of regular participles. The performance of the L1 group was influenced by "combinatorial structure" of regular participle forms which meant the decomposition of multimorphemic words, whereas the L2 group was not influenced by the so-called "combinatorial structure". In parallel with the findings of Silva & Clahsen (2008), the results of this study suggest that adult L2 learners are less sensitive to morphological structure than native speakers, and they rely more on lexical storage than on morphological parsing during processing (Neubauer & Clahsen, 2009).

A similar study was carried out by Kırkıcı & Clahsen (2013). This more recent morphological processing study has focused on morphological differences between inflectional and derivational processes. The study differs from the others as it focuses on a non-Indo-European language, namely Turkish. The processing of Turkish inflectional and derivational morphemes has been compared in adult L1 Turkish speakers and adult L2 Turkish learners. Two highly frequent, productive and transparent suffixes, inflectional aorist –(I/A)*r*, and derivational deadjectival *–lIk*, were used in priming experiments to scrutinize the morphological processing. Different priming patterns were found between inflectional and derivational suffixes especially in the L2 group. The results revealed that both L2 advanced learners of Turkish and L1 Turkish native speakers showed significant morphological priming effects for derivational morphology. In other words, the processing pattern of L2 advanced learners of Turkish was more native-like for derivational morphology compared to the processing of inflectional morphology.

It is important to note that not all studies have revealed native vs. non-native differences. For example, in a masked priming study, Diependaele et al. (2011) compared the morphological processing patterns of two groups of bilinguals (i.e. Spanish–English and Dutch–English bilinguals) and native English speakers. They tested prime –target pairs such as transparent suffixed prime (e.g., viewer–view), opaque or pseudo suffixed prime (e.g., corner- corn) and form control prime (e.g., freeze-free). They found that the degree of facilitation in the masked priming experiment was graded. In other words, the largest priming was observed in the transparent condition, whereas the smallest priming effects were observed in the form condition. Intermediate priming was experienced for the opaque suffixed or pseudo-suffixed prime conditions. Based on these results, the researchers concluded that bilinguals largely adopt the same processing strategies as native speakers.

Although it was carried out with a word recognition task rather than a priming experiment, Lemhöfer et al., (2008) reported results similar to the findings of Diependaele et al. (2011). They compared the word recognition patterns of adult French, German and Dutch speakers with English as their L2. The results demonstrated that bilingual speakers of different native languages processed the L2 words in largely the same way as L1 speakers did other than some small differences which were primarily accepted to be due to "the sensitivity to frequency-related variables such as written versus spoken frequency, morphological family size, and number of syntactic categories" (p. 27). Although L1-specific effects on L2 word recognition were observed to be less, L2 speakers differed from monolinguals in terms of frequency-related aspects regarding the organization of their language processing system. In short, irrespective of what native languages the participants had, their word recognition patterns were similar, yet this was different from that of the L1 speakers. Therefore, the study suggested that L2 processing was different from word processing in L1.

As discussed above, the L2 research findings are not conclusive as to whether late bilinguals adopt the same processing strategies as native speakers. In other words, there is a need for further research from different language pairs to identify whether late L2 learners, unlike native speakers, rely more on full-listing in processing derivational (and inflectional) morphemes as suggested by several studies (e.g., Clahsen et al., 2010; Ullman, 2004, 2005) or whether they can achieve native-like processing in accessing complex L2 words as suggested by Diependaele et al. (2011) and Feldman, Kosti´c, Basnight-Brown, Filipovi´c Durdevi´c, & Pastizzo, (2010) and Kırkıcı & Clahsen, (2013).

2.3.3 Morphological Processing Studies Conducted in Turkish

To find a clear answer to how multimorphemic words are represented and accessed in the mental lexicon, it is necessary to obtain more crosslinguistic morphological processing data because more evidence from a variety of languages is necessary to clearly understand the organization of mental lexicon (Marslen-Wilson et al., 1994).

The results of morphological processing experiments carried out in Turkish could contribute to the question of how the mental lexicon is organized in agglutinative languages. In highly inflected agglutinative languages, such as Turkish, the lexical access to morphologically complex words is deemed to include "decomposition" rather than "full listing", and this is explained by storage efficiency (Hankamer, 1989). Since relatively high number of possible combinations of morphemes exists in Turkish, the direct access route is thought to be less likely in processing multimorphemic words.

One of the early morphological processing studies in Turkish was done by Gürel (1999) to test whether decomposition or full listing was dominant in processing morphologically complex inflected words. Monolingual Turkish speakers were tested via a simple lexical decision task, and it was found that the frequency of the suffix effected the morphological processing pattern. The words that were inflected by frequent suffixes (e.g., stem-plural; stem-locative) were processed by whole-word access while the words that were inflected by less frequent suffixes (e.g., ablative form) were parsed into its morphological constituents. Based on the findings of her study, Gürel (1999) argued that suffix frequency has an effect on whether a complex word is accessed through a direct route or a parsing route. She concluded that the higher frequency of a suffix makes processing easier and faster; in addition, the recognition of morphologically complex words is not as costly as it might be in languages with smaller number of inflectional morphemes.

In a more recent simple lexical decision study examining the processing of inflectional multimorphemic words in Turkish, Gürel & Uygun (2013) compared native and non-native speakers of Turkish using Gürel's (1999) materials. The study revealed that Turkish native speakers did not show a significant RT difference in accessing multimorphemic (as well as pseudomorphemic) items and monomorphemic words. This was taken to indicate a full listing procedure rather than decomposition of multimorphemic words. In addition, the word recognition of higher proficiency learners was similar to that of native speakers. However, less proficient learners tended to decompose multimorphemic words. Based on the findings of the research it is concluded that "for the sake of computational efficiency, complex forms are accessed via a direct route whenever possible" (Gürel & Uygun, 2013, p.131).

In a more recent study, Uygun & Gürel (2016) explored, on the basis of Gürel (1999) items, potential L1 effects on processing L2 processing of complex words with nominal inflection. The results of an unprimed (i.e. simple) lexical decision task revealed that while L1-Russian learners of L2 Turkish demonstrated decomposition, L1-English learners of Turkish, like native speakers of Turkish, did not appear to rely on morpheme-based parsing in accessing complex Turkish words. The study also revealed L2 proficiency-based differences in the extent of L1 transfer in processing inflection.

As noted earlier, Kırkıcı & Clahsen's (2013) study examined the processing of Turkish derived and inflected words via masked priming. Their findings revealed that inflected and derived words were processed similarly (both involved decomposition) for native speakers of Turkish. The L2 Turkish group, however, demonstrated a different morphological processing pattern for derived and inflected forms (i.e. decomposition for derivational morphology but not the inflectional morphology).

Thus more studies are needed to clearly understand how complex words are processed by native speakers and L2 learners of Turkish. Different types of morphology (both inflectional and derivational) need to be tested to identify this issue of processing agglutinating languages.

2.4 Morphological Processing and Reading Fluency

As mentioned earlier, the secondary aim of this dissertation is to explore potential relationship between reading fluency and morphological processing patterns. Therefore, it will be relevant to provide a brief note on reading fluency and morphological processing. However to my knowledge, no study has been carried out so far to examine such relationship. Therefore, the studies discussed in this section are not directly concerned with a relationship between reading fluency and morphological processing. Rather they focus on the development of morphological awareness as measured via mostly untimed metalinguistic tasks such as fill-in-the-blank type of traditional tasks. In that sense, the test paradigms used in morphological awareness studies are generally rather explicit tests. However, unlike most morphological awareness tasks used in the literature, the masked priming paradigm that was employed in the current study is believed to tap unconscious processing and implicit morphological computation of the participants. To the extent that participants are able to do such computations as would be revealed by their decompositional word recognition, we can say that they can access the morpheme-level information in online processing. This would also imply knowledge of morphology at some unconscious level. This does not necessarily imply explicit, conscious, metalinguistic knowledge about the internal word structure of derived words. Nevertheless, it still suggests that participants are sensitive to morphological structure of a complex word. The extent of decompositional processing (i.e. morphological priming) can then be examined in relation to an independent reading fluency measure. This way, we can see whether or not these constructs correlate with each other.

The subsections presented below will first give information about reading fluency, and then morphological awareness. The relationship between reading fluency and morphological awareness is presented separately for L1 and L2.

2.4.1. Reading Fluency

The definition of reading fluency is difficult to formulate due to several reasons. First of all, fluency itself is complex construct. It involves rapid and accurate processing of different levels of grammatical information including morphology, syntax and prosody. Moreover, it inevitably requires automatic processing, substantial amount of reading, and both incidental/implicit and conscious learning are required to obtain fluency in reading. In the National Reading Panel (2000) reading fluency was defined as the speed/rate and accuracy with which a text is reproduced into spoken language and it was asserted that fluency would occur both in oral and in silent modes of reading. In a similar vein, Grabe (2009) describes reading fluency as “the ability to read rapidly with ease and accuracy, and to read with appropriate expression and phrasing. This involves a long incremental process, and text comprehension is the expected outcome”. Based on this definition, reading fluency necessitates skills in rapid letter decoding, word recognition, rapid reading rate, extensive “exposure to print”, accuracy in comprehension, incremental learning, a large recognition vocabulary and extended periods of implicit learning (Grabe, 2009). Reading fluency was also considered to be a critical factor in L1 reading development and achievement.

Congruent with this, the research on reading fluency demonstrates that the development of reading fluency can be achieved by either extensive reading, repeated reading or timed reading. It is possible to see various studies carried out to find the role of extensive reading (Waring, 1997; Day & Bamford, 1998), repeated reading (Samuels, 1997; Gorsuch & Taguchi, 2008), and timed reading (Chang, 2010; Underwood, Myskow & Hattori, 2012) on reading fluency. However interesting they are, these studies will not be covered in this dissertation since the focus of the current study is to investigate the relationship between reading fluency and morphological processing.

Reading fluency is considered to be primarily achieved by automatization of word recognition. Once a reader achieves the automatic recognition of words, the focus of attention is diverted to meaning of the text rather than on decoding words (Chang, 2010).

As a result, the text becomes more comprehensible for the reader. Day and Bramford (1992) express word recognition as the basis of fluent reading and describe it as something that allows skilled readers to read easily without effort and to move rapidly through the reading material.

Although the terms of automaticity and fluency are used interchangeably, some researchers make a distinction between them. For instance, Harris & Hodges (1995, p. 85) define fluency as "freedom from word identification problems that might hinder comprehension"; and they define automaticity as "fluent processing of information that requires little effort or attention." In some general sense, well-practiced skills and deeply ingrained habits are generally characterized as automatic due to the fact that we perform them easily with little effort and little conscious thought (Logan, 1997). Riding a bicycle and shifting gears of a manual transmission car are good examples of automatic processing. In this sense, reading is also a noticeable example of automatic processing among certain cognitive tasks. This is because we look at a page and get meaning without much effort or conscious awareness of the processes that derive meaning from print. Logan (1997, p. 125-126) compares the characteristic of automatic processing with that of non-automatic as follows: "Automatic processing is effortless. Non-automatic processing is effortful. Automatic processing is autonomous, in that it begins and runs on to completion without intention. Non-automatic processing is deliberate, in that it cannot begin and end without intention." In the context of reading fluency, the first steps of reading, which need to be automatized, involve letter decoding and word recognition.

In sum, reading fluency is a complex phenomenon with lower- and higher-level subcomponents. To achieve fluency in reading comprehension, all subcomponents need to be automatized gradually. Automaticity in word recognition is one of the subcomponents of fluent reading. As discussed in previous sections, words that we need to recognize while decoding language may be simple or may involve complex morphology. Therefore, accessing and recognizing multimorphemic words are directly relevant to achieving fluency in reading.

2.4.2 Morphological Awareness

Morphological awareness is considered to be part of metalinguistic awareness. To understand morphological awareness clearly it would be better to define metalinguistic awareness first. We are usually unaware of the linguistic system we depend on when we are communicating and interacting with others. However, if we are asked to envisage that system, we can, to a certain extent, achieve this. This happens as a result of our metalinguistic knowledge. Therefore, metalinguistic awareness can be defined as the ability to think consciously about language and linguistic objects such as sounds, words and sentences apart from their use in ordinary communication (Fernandez & Cairns, 2011; Naggy & Anderson, 1995). Nevertheless, our linguistic knowledge constitutes a tacit and implicit knowledge of language which means that we do not have conscious access to the rules and principles that organize the combination of sounds, words and sentences. Yet, we are still able to recognize when those rules and principles have been violated. This ability is considered an important aspect of metalinguistic awareness (Fernandez & Cairns, 2011, p.60).

Morphological awareness is described as a learner's grasp of morphological structure and the ways how morphemes are joined in words (Koda, 2000). It incorporates learners' capability for using this knowledge during morphological processing in visual word recognition. It also helps readers understand the segmental nature of words, which, in turn, promotes an analytical approach to word recognition and word learning. To consider it specifically within a word the knowledge about morphemes may lead to morphological awareness, which is described by Zhang and Koda, (2008, p. 1) as the "ability to analyze and identify a word's morphological constituents".

Basing her opinions on empirical findings, Koda (2005, p.86), claims that the ability to analyze words' morphological structures is a major factor in differentiating poor and good readers. This idea is supported by Naggy & Anderson, (1998), who estimate that roughly 60% of the new words encountered in school materials are morphologically complex and structurally transparent words. Therefore, the meanings of words can be deduced on the basis of their morphological constituents instead of making use of contextual clues and background knowledge. If, however, the learner lacks morphological awareness and the ability to segment complex words into its constituents, the new usage of a known word may go unnoticed (Koda, 2005).

Morphological awareness is also known to be contributing to the school age student's reading performance, word spelling and nonword reading in English (Carlisle & Fleming, 2003; Carlisle, 2003; Singson et.al, 2000; Deacon & Kirby, 2004). Thus, it is claimed to be effective in reading in English. Morphological awareness is said to have facilitative effects in the development of reading competence since it eases transition from oral to written communication, and promotes an analytical approach to word learning by the ability to segment the words into its constituents. However, when readers lack this analytical ability, they experience serious problems in extracting even partial information from an unfamiliar word (Koda, 2000).

As for some other benefits of morphological analysis, Carlisle (2003b, p. 295) highlight that “the familiarity and redundancy of the word parts serve as aids to memory and facilitate language learning, particularly when compared to treating each complex word as a unique word”. Yet, awareness is necessary to take advantage of these benefits. This awareness includes the knowledge “that words are sometimes made up of smaller recognizable units (morphemes) which, when identified, can serve as clues to decode the word and infer its meaning.” Kieffer & Lesaux (2010) support this idea and mention that an L2 learner with sufficient morphological awareness may infer the meaning of a word with the help of his/her knowledge of the grammatical category of a word.

Due to the nature of derivational suffixes and partly because English has many derivational suffixes, school age children develop the awareness of derivational morphemes relatively late compared to inflectional suffixes (Carlisle & Fleming, 2003). Inflectional awareness, according to Zhang and Koda (2013), is acquired at the beginning of elementary school by the native speakers of English, whereas the acquisition of derivational awareness is acquired comparatively late. This late acquisition is attributed to the phonological and/or orthographic changes taking place in the word stem when an English derivational suffix is added to the base (e.g., decide and decision) (Zhang & Koda, 2013).

2.4.3 The Link between Morphological Processing/Awareness and Reading Fluency

Morphological awareness is assumed to facilitate several subcomponents in a reading task ranging from single word reading to uncovering the meaning of words. It may also be helpful in individual word decoding, reading comprehension, and nonword reading (Deacon & Kirby, 2004). Morphemes are said to facilitate both word reading and understanding of words and texts (Carlisle, 2003). This facilitation effect of morphemes on reading is described by Mahony, Singson & Mann (2000), and it is attributed not only to the meaning and structure of morpheme but also to distributional, syntactical, phonological and relational features, as well. Among these features the awareness of phonological, syntactic and relational properties is considered to be quite important for decoding and comprehension (Mahony et al. 2000).

The literature on reading comprehension or fluency includes both L1 and L2 studies (Grabe, 2009). Similarly, the relationship between morphological awareness and reading fluency/comprehension is discussed separately for the L1 and L2. The studies concerning the role of morphological awareness on reading in L1 English focused mostly on the early development of reading skills in elementary school years. Longitudinal studies have been carried out to identify the long term effects of morphological awareness on reading in the L1. On the other hand, most L2 studies have focused on crosslinguistic issues such as the effects of L1 morphological awareness on L2 (Koda, 2000; Zhang & Koda, 2008). However few in number, there are also some psycholinguistic studies probing into the morphological processing patterns and word recognition (e.g. Kim, Wang, & Ko, 2011).

Research into the connection between morphological awareness and reading comprehension is not new. For instance, Mahony (1994 as cited in Deacon & Kirby, 2004) used Scholastic Aptitude Test (SAT) scores and a derivational suffix test to measure the correlation between reading comprehension and morphological awareness. This study revealed positive correlations between the reading comprehension scores of adolescents and their morphological awareness.

The following sections present relevant L1 and L2 studies examining the relationship between morphological awareness and reading fluency. It is important to keep in mind that most of the morphological awareness studies employed traditional tasks that assess conscious knowledge of morphology in L1 and L2 users. To my knowledge there is not any study exploring specifically the relationship between reading fluency and online unconscious morphological processing, as examined in this dissertation. Nevertheless, the studies discussed below are revealing as to whether the sensitivity to morphemic structure can play a role in achieving fluency in L2 reading.

2.4.4 L1 Studies on Morphological Awareness and Reading Fluency

The effect of morphological awareness and its connection with reading is widely studied in English as L1 (Carlisle & Fleming, 2003; Deacon & Kirby, 2004; Singson et al, 2000). Most of these studies are carried out with primary school students. For example, Carlisle & Fleming (2003) explored a potential correlation between the first and third grade elementary school students' lexical processing and their future (i.e. two-year later) reading abilities. In the first grade the participants were given two tasks of lexical analysis of morphologically complex words. These tasks were "The Word Analysis Test" and "Test of Absolute Vocabulary Knowledge" (Anglin, 1993). In their third grade they were given a reading comprehension test and a measure of derived word processing in sentence context, which is referred to as the Test of Morphological Structure. Results of the study showed an association between lexical analysis of complex words and reading comprehension in the third and fifth grades. Moreover, knowledge on the semantic and syntactic features, knowledge of morphemes was found to facilitate morphological processing of words and to contribute to reading comprehension in the late elementary years (Carlisle & Fleming, 2003). The results of the study suggest that third graders are more capable of meaning-driven morphological processing than first graders. However, even for the first graders, the lexical analysis of complex words is related to morphological analysis in words and sentences and contributes to reading comprehension two years later.

In their four-year longitudinal study, Deacon & Kirby (2004) compared phonological and morphological awareness in three aspects of reading development which included nonword reading, reading comprehension, and single word reading skills. They measured phonological awareness via a sound oddity task. Morphological awareness was measured via the Sentence Analogy task of Nunes, Bryant & Bindman (1997a, 1997b). The reading comprehension was measured on the basis of three subtests from the Woodcock Reading Mastery Tests—Revised (Woodcock, 1987). The result of the study revealed that morphological awareness contributed significantly to nonword reading and reading comprehension when prior measures of reading ability, verbal and nonverbal intelligence and phonological awareness were controlled for. Therefore, sufficient evidence was provided to show that morphological awareness had a wide-ranging role in reading development.

The way how morphological awareness influences reading process is explained by Keiffer and Lesaux (2008) in two ways. First, it is claimed that word-specific knowledge involved in morphological awareness facilitates the comprehension of texts consisting of morphologically complex words. Second, having the ability to decompose morphologically complex words could result in better understanding of the processed vocabulary.

Singson et al. (2000) attempted to find the role of derivational morphemes in reading in English. They measured the knowledge of derivational suffixes via sentence completion and sentence acceptability tasks in which real (e.g., electric, electricity) and pseudo-derived (e.g., froodly, froodness) words were used. They found that success on the derivational suffix materials made an independent and increasing contribution to decoding ability throughout the higher elementary grades.

All of these L1 studies demonstrate a relationship between morphological awareness and reading. We see that an increase in morphological awareness contributes to reading in L1. Although they are fewer in number, similar studies have also been conducted in L2 acquisition. The following section provides a brief overview of offline experiments that tested morphological awareness of L2 learners

2.4.5 L2 Studies on Morphological Awareness and Reading Fluency

Among the L2 studies that examined the effect of morphological processing on reading development and reading comprehension in L2 (Clahsen et al, 2010), Zhang and Koda (2008) investigated crosslinguistic relationship of morphological awareness in Chinese and English. More specifically, the relationship between L1 and L2 morphological awareness and their relative contributions to L2 reading comprehension were investigated with 45 fifth and 51 sixth grade children learning English as a foreign language in China. L1 Chinese and L2 English morphological awareness of the participants were measured in addition to their L2 English reading comprehension and nonverbal IQ. Morphological awareness was measured through morpheme recognition tasks (in Chinese and in English), which were designed to measure the ability to segment a morphologically complex word and recognize its stem. The results of the study reveal that L1 morphological awareness contributes to the formation of L2 morphological awareness to a far greater extent than L2 reading. Furthermore, L1 morphological awareness is stated to be a strong predictor of L2 reading comprehension. The results of the study suggest that when subskills of reading are once acquired in one language, they become available in another. Therefore, these skills may facilitate the development of corresponding skills in the new language (Zhang &Koda, 2008).

Kieffer and Lesaux (2008) designed an offline (pen-and-paper) experimental research task to investigate the effect of morphological awareness on reading comprehension in Spanish-speaking L2 learners of English. Their longitudinal study revealed that the relationship between morphological awareness and reading comprehension was strengthened from the fourth to fifth grade; and in the fifth grade, morphological awareness was found to be a significant predictor of reading comprehension.

In a crosslinguistic study, Ramirez et al. (2010) compared English and Spanish morphological awareness of Spanish learners of English and explored the contribution of L1 and L2 morphological awareness to word reading in the L1 and L2. Their aim was to show that morphological awareness would be facilitative for word reading, literacy development and reading comprehension not only for the languages that have deep orthography, but also useful in shallow orthographies. Therefore, they investigated the role of morphological awareness in word reading in 97 Spanish-speaking children in grades four and seven. They used a multiple choice sentence completion task adapted from Singson et al. (2000) to assess morphological awareness in English and developed a similar test to assess it in Spanish. Morphological production of the participants was assessed with the Test of Morphological Structure designed by Carlisle (2000). A Letter-Word Identification Subtest from the Woodcock Language Proficiency Battery (Woodcock, 1984) was used to assess reading proficiency. The results revealed that after controlling for other reading-related variables, Spanish morphological awareness contributed to Spanish word reading. English morphological awareness also contributed to English word reading. Moreover, morphological awareness was transferred cross-linguistically from Spanish to English but no transfer was observed from English to Spanish.

In another study, Jeon (2011) aimed to identify the role of morphological awareness in paragraph reading rather than word reading. A group of 188 tenth grade L1 Korean-speaking learners of L2 English participated in the study. Some control variables such as phonological decoding, word knowledge, listening comprehension and metacognitive awareness of reading were used to uncover the effects of morphological awareness on paragraph reading. Two pen-and-paper morphological awareness tests adapted from Carlisle (2000), and Schmitt & Meara (1997) were used. The regression analysis revealed that morphological awareness was a significant predictor of L2 reading comprehension when other variables were controlled for. Particularly, morphological awareness of derived words contributed to L2 reading comprehension. Although this study has found a relationship between morphological awareness and L2 reading, the pen-and-paper morphological awareness tests used in the study were presented as a limitation of the study.

The studies mentioned here are all based on offline experiments to test morphological awareness and to explore its relation with reading comprehension. The present study, however, will be the first to provide online lexical decision data to identify the real-time lexical processing in morphologically complex words, and to explore potential relationship between the lexical processing pattern and reading fluency.

CHAPTER 3

METHODOLOGY

This section details the methodology of the study including the participants, tasks, task items and the procedure. Finally, the data analysis procedures are presented.

3.1 Participants

The L2 participants of the study were 70 male L1-Turkish EFL learners studying at a state boarding school in Istanbul. They were 10th, 11th and 12th graders with a mean age of 17.43. They were divided into two groups based on their English proficiency levels. According to the results of the Oxford Quick Placement Test (OQPT) and its guidelines (see Table 3.2), 35 students who received scores between 25 and 30 out of 60 were placed in the pre-intermediate group, and 35 students whose scores ranged between 40 and 47 were placed in the upper-intermediate level. Detailed information about the participants is presented in the table below. The study also involved a baseline control group that consisted of 23 native speakers of English aged between 26 and 60 with a mean age of 43.76.

Table 2.

Demographic and linguistic background of participants

Groups	Grade	Mean Age (range)	Mean OQPT score (range)	Mean age of first English exposure (range)	Mean length of English exposure (range)
Pre-intermediate (n= 35)	10-11	16.94 (16-18)	26.41 (25-30)	10.45 (10-11)	5.4 years (5-6)
Upper-intermediate (n= 35)	11-12	17.85 (17-19)	41.2 (40-46)	10.38 (9-11)	6.7 years (6-7)
Native speakers (n= 23)	N/A	43.76 (26-60)	N/A	At birth	Since birth

All L2 participants started learning English at the beginning of grade 9. Although they studied English in the secondary school for several semesters, their English knowledge remained rudimentary until grade 9, when they were exposed to an intensive English teaching program and started to improve their English competence. Starting from the 9th grade, students have received 10 hours of English classes each week until their graduation at the end of grade 12. All participants had either normal or corrected-to-normal vision, were never diagnosed with any learning or other behavioral disorders, and were naive with respect to the purpose of the experiments.

3.2 Instrumentation and Procedure

Three different tests were used to carry out this study. These included the Oxford Quick Placement Test (OQPT) to obtain an independent measure of proficiency, the Woodcock Johnson Reading Fluency Test, and two online computer-based word recognition tasks (i.e. visual masked priming tasks). A brief note on these data collection tools and the procedures is presented below.

3.2.1 The Oxford Quick Placement Test

The Oxford Quick Placement Test is a pen-and-paper-based test used to determine the proficiency levels of the participants. The test consists of 60 multiple choice questions each of which has one correct answer and 2 or 3 distracters. The test items are listed from the easiest to the most difficult in the test pack. Depending on the test score, participants can be classified as elementary, pre-intermediate, intermediate, upper-intermediate, advanced and proficient learners. The score intervals of the test are presented in Table 3.2. The test has two parts. The first part consists of 40 questions, whereas the second part has 20 items. Test takers are not allowed to take the second part of the test unless they complete the first part.

Table 3.

OQPT scoring chart

Score	CEFR	Level
0-17	A1	Elementary
18-29	A2	Pre-Intermediate
30-39	B1	Intermediate
40-47	B2	Upper-Intermediate
48-54	C1	Advanced
55-60	C2	Proficient

3.2.1.2 The Oxford Quick Placement Test Procedure

Since the test had two versions with identical questions presented in different orders half of the students took version 1 and the other half took version 2. Before giving the test, its aim was explained to the participants briefly. In addition, the participants were instructed about how to answer the questions and how to mark the answers on the machine-readable answer sheet. Moreover, they were assured that the results of the test were not going to affect their grades in their English lessons. The time allowed for the test was at most 45 minutes. The participants were allowed to hand in the test and leave the testing room as soon as they are finished. A teacher accompanied the students as an observer during the test. Since the answer sheets were machine-readable, the scores were evaluated quickly through a scanner and were transferred into digital forms.

The scores were listed from the highest to the lowest. Those who received more than 40 on the test were classified as the upper-intermediate group and were encouraged to volunteer to participate in the study. The students whose scores were between 20 and 30 were placed in the pre-intermediate group. The number of volunteers in this group outnumbered the students in the upper-intermediate group. Nevertheless, only 35 of them were invited to take part in the study to keep the number of participants equal in each group.

3.2.2 Reading Fluency Test

In order to investigate a potential relationship between the morphological processing pattern and reading fluency, the study included a reading fluency test at the sentence level. By measuring the reading fluency at the sentence level rather than the paragraph level, I aimed to avoid any possible confounding factors associated with passage reading such as lack of necessary background information or lack of certain reading skills involving guessing the meaning, skimming, scanning, making inference on the part of the learners. A standard reading fluency test which was developed as a sub-test of the Woodcock Johnson Achievement Test Form C was used to measure the reading fluency levels of the participants. This test is designed to diagnose reading fluency in individuals who are literate in English and no age limitation is reported in the test administration.

The Reading Fluency Test measured fluency at the syntactic level. Both accuracy and speed in the processing phrase and sentence units were tested. The test is composed of 128 statements starting with simple and short sentences (e.g., Fire is hot) and moving on to longer and complex sentences (e.g., People usually wear coats when the weather is very hot). The participants were directed to read silently and circle Y for "yes" or N for "no" after each sentence, depending on whether they found the statement true or false. They were allowed to take 3 minutes as directed in the user's manual of the test. There were 68 true and 60 false statements on the test. An example for a true sentence is: '*Flowers grow in garden'*, whereas *'A frog can attend traffic school each Saturday'* is an example for a false sentence.

The reading fluency scores of the test takers were calculated as instructed in the user's manual of the test. Based on the scoring instructions on the manual, all of the correct answers were counted as 1 point; and the total number of the correct answers constituted the total reading fluency score. Incorrect answers or unanswered items were not taken into consideration in the calculation of the total score.

3.2.2.1 Reading Fluency Test Procedure

The reading fluency test was given to the participants after they were placed into pre-intermediate and upper-intermediate groups based on their OQPT scores. The students were told that the test would measure their reading fluency level. The Reading Fluency Test booklets were handed out and students were asked to circle the letter ‘Y’ if they thought that the sentences were semantically true and ‘N’ if they were false. Students wrote their names and student control numbers on the test booklets. Four or 5 sample statements similar to those in the test were read aloud to the students prior to the real test as trial items. This helped them to have an overall idea about what kind of sentences they would encounter in the test. They were also told that the whole test time was 3 minutes and everyone would start and stop at the same time. The students were informed about the time when 30 seconds were left. All the test booklets were collected at the end of three minutes.

The reading fluency scores of the participants were calculated depending on the sum of the correct responses they gave within 3 minutes. The correct answers were tallied with the help of the transparent answer sheet supplied by the testing company and the results were written at the top of each participant’s test booklet and then typed in Microsoft Excel Program to be used in the analysis of results.

3.2.3 Visual Masked Priming Experiments

The masked visual priming technique (Forster & Davis, 1984) was designed to measure the RTs of the participants. Two visual masked priming experiments, one in L1 Turkish and one in L2 English, were designed and administered. The experiments were designed to identify how participants would process morphologically complex words (derived words) in the L1 and the L2. To this aim, two derivational morphemes were selected both in English and Turkish. The Turkish experiment involved derivational suffixes -*sIz* and -*lI*, which are used to make adjectives out of nouns and the English experiment consisted of the corresponding derivational morphemes -*less* and *–ful*, which also derive adjectives out of nouns Therefore, the morphological processing patterns of L2 learners both in their L1 and their L2 were identified with parallel tests involving analogous derivational morphemes.

Three different prime-target conditions were tested in two separate experiments. These conditions were called "Identity", "Test" and "Unrelated" as they were named in the experiments conducted by Silva and Clahsen (2008) and Rızaoğlu (2016). To give an example from the Turkish experiment, the identity condition stimuli were composed of prime-target pairs which were identical such as *dikkat* - *DİKKAT* 'care – CARE'). The priming words in the test condition were composed of multimorphemic words derived by the two target morphemes (-*lI* and -*sIz*) that are used in the study (e.g., *dikkatli* - *DİKKAT* 'careful – CARE'). The third condition was the unrelated prime condition that included primes which were orthographically, phonologically, morphologically, and semantically unrelated to the targets (e.g., *kapı* - *DİKKAT* 'door –CARE').

The RT differences among these three conditions reveal the answer to the question of whether multimorphemic words are decomposed or accessed in full forms. A probable RT difference between the identity and the test conditions on the one hand, and the difference between unrelated and test conditions on the other hand are taken as a measure of priming. More specifically, full priming, partial priming, repetition priming and no priming are the four categories discussed in the priming experiments (Silva & Clahsen, 2008; Neubauer & Clahsen, 2009). Potential priming effects are determined by comparing the mean RTs in the test condition (e.g., careful - CARE) with the mean RTs of unrelated (e.g., door - CARE) and identity conditions (e.g., care - CARE). The identity and the unrelated conditions can be described as baseline conditions which reflect the minimum and maximum amount of facilitation for a given lexical item. Full priming exists, if there are no differences between the test and the identity condition in terms of RTs and both conditions have shorter RTs than the unrelated condition. This can be formulized as "Identity Condition = Test Condition < Unrelated Condition". Partial priming exists on the condition that RTs for the target word after the test prime are shorter than the RTs for the target words after an unrelated prime but longer than the identity prime. This can be formulized as "Identity Condition < Test Condition < Unrelated Condition". Repetition priming takes place when the identical priming condition yields shorter RTs than the unrelated condition, which can be represented as "Identity Condition < Unrelated Condition"

To have accurate results, RTs were measured precisely in milliseconds; therefore, care was taken to ensure that appropriate words were selected for the priming experiments. With this respect, the length (number of letters and number of syllables in a word) and the frequency of the words were kept as similar as possible in order to ensure that the results from the Turkish and English experiments are comparable.

Two different corpora, one for Turkish and the other for English, were used for this purpose. The Middle East Technical University Turkish Corpus (Say, Zeyrek, Oflazer & Özge, 2002) was used to select the appropriate words in the Turkish masked priming experiment. This corpus consists of two million words taken from post-1990 written samples of Turkish. The frequencies reported in this corpus are given per million. The English items were chosen based on their frequencies presented in SUBTLEX-US (Brysbaert & New, 2009). The frequency norms of SUBTLEX-US are based on a corpus of 51 million tokens of American English movie subtitles.

Special caution was exerted to maintain a close match between word frequencies in Turkish and in English. Thus, the Turkish items had a mean frequency of 49.83 and the English items had a mean word frequency of 48.79 per million. The mean frequencies of the words derived with *-ful* and *-less* in English (i.e. whole-word frequency) were still slightly lower when compared to the mean frequencies of the Turkish words derived with *–lI* and *–sIz*.. The frequencies of the target words are discussed in detail in the following sections.

3.2.3.1 The Procedure of Masked Priming Experiment

As noted earlier, L1-Turkish L2 learners of English participated in both Turkish and English experiments. In masked priming experiments, each participant was tested individually. They completed the three different versions of each test (Turkish and English) on three different days. In other words, unlike the Latin Square Design, in which a participant takes only one version of the test, in the current study, the same participants took all three versions of a masked priming experiment. However, to ensure that the participants did not see the same target word repeatedly after each of the three prime words on the same session, they took the three versions of the test on different days. They completed the Turkish and an English version at the same session with an interval of 10 minutes between the two experiments.

The participants were given a trial version of the masked priming experiment prior to the real test. This trial version was similar to the real experiment; however, the number of the items was limited to 15. With this trial version, participants got accustomed to what they were going to do on the actual test. The trial version of Turkish experiment was completed first, and then the actual masked priming test was administered. After a break of 10 minutes, the participants took the trial version of the English test and then started doing the actual test in English. Some of the participants finished three versions of the test on 3 consecutive days, whereas for most of them the time intervals among tests were more than a day. This was arranged mostly considering their free time.

All the data were collected through a laptop computer. Before the test, participants were informed about the general purpose of the research; they were told how they would contribute to the study. They were informed that they were going to see a string of letters on the screen and decide whether they were 'real words' or 'nonwords'. The zero (0) key of the computer was assigned as the 'Yes' answer with a letter of 'Y' stuck on this key Similarly the one (1) key of the computer was assigned for the 'No' answer and a letter of 'N' stuck on this key. Participants were requested to press the letter 'Y' if they thought the letters on the screen represented a real word or letter 'N' if they thought it represented a nonword. The participants saw the following sentences on the screen in the trial and the test versions of the experiment: *'In this experiment you will see a series of ##### signs. After that you will see a string of letters. Please read them as quickly as possible and press the 'Y' button if you think it is a real word in English. If you think it is not, please press the 'N' button. Press the 'SPACE' button to proceed.'*

In addition to this written form, an oral instruction was given to each participant. Participants were not allowed to start the experiment until they understood the instructions and felt confident to start the test. Each version of the experiment lasted about 7 to 9 minutes depending on the pace of the participant.

E-Prime software version 2.0 (Schneider, Eschman & Zuccolotto 2002) was used to measure the RTs given to the target words primed by different categories of words. Testing started with the display of fixation point which was composed of hashes (#####) and stayed on the screen for 500ms. The prime followed the hashes and appeared on the screen for 50ms. The target appeared immediately after the prime and stayed on the display until the participants responded. The prime and target stimuli were presented on a 13.3-inch monitor in black letters (font: Courier New, size: 18) on a white background. Target words were shown in upper case letters whereas the primes were presented in lower case letters. This procedure prevented a possible overlap between the targets and the primes.

After the experiments, the participants were asked whether they knew the meanings of the words or not. This was to ensure that the target words used in this processing experiment were known to the participants. It was found out that all test items were familiar with them. Furthermore, after the experiments, the participants were asked whether they had seen a word prior to the target words and none reported having seen the prime words. This suggests that prime words were not activated at a conscious level.

3.2.3.2 Items of Masked Priming Experiment in L1 Turkish

The total number of experimental items used to test the role of derivational morphemes was 18. These critical test items were composed of 9 adjectives derived with the suffix *-lI* and 9 adjectives derived with the suffix *-sIz*. The critical items were chosen according to their base (stem) and whole word (derived) frequencies as reported in the Middle East Technical University Turkish Corpus (Say et al. 2002). See Table 4 for the mean frequencies of the critical items. The items in each of the two testing conditions (*-lI* and *-sIz*) were similar with respect to their frequencies, number of syllables and number of letters. However, the words derived with *-sIz* had naturally one more letter than the items derived with the suffix *-lI* due to the length difference between these two suffixes.

Table 4.

Mean frequencies and frequency ranges of test items in Turkish Experiment

Prime types	Base (stem) frequency and (range) of the primes	Whole-word (derived form) frequency of the primes	Frequency of unrelated primes	Frequency of Target words
Morphologically related: *-lI*	48.33 (15-79)	43.44 (14-87)	48.44 (15.77)	48.33 (15-79)
Morphologically related: *-sIz*	51.33 (14-79)	28.56 (14-44)	51.11 (14-77)	51.33 (14-79)

In addition to the 18 critical test items, 18 unrelated and 18 identical prime words were used to constitute the masked priming experiment. Details about the item numbers and an example for the prime – target pairs are presented in Table 5.

Table 5.

Item numbers and an example from prime-target pairs

	Identity	Morphologically related: -*lI*	Morphologically related: -*sIz*	Unrelated	Target
Number of critical items	18	9	9	18	54
Example	*Uyku* (sleep)	*Uykulu* (sleepy)	*Uykusuz* (sleepless)	*İlçe* (Province)	*UYKU* (SLEEP)

The unrelated primes had no obvious semantic relationship with the target (e.g., *ilçe-UYKU* 'province - SLEEP'). To be sure that there was no relationship between the target word and the prime, the collocation of the words were checked in the book entitled "Türkçe Kelime Normları" (Turkish Word Norms) by Tekcan & Göz (2005). Furthermore, the number of common letters and phonemes in the unrelated primes and the targets was kept to minimum as much as possible. Among the entire prime- target sets only 4 of them had common letters. The mean number of shared letters between unrelated prime and the target words was 0.11 for the morphologically related *–lI* and 0.44 for the morphologically related *–sIz* condition. Please see Table 6 for the range and the mean number of the letters, syllables and the number of shared letters between the targets and the primes. The complete list of test items and their frequencies for the Turkish masked priming experiment are presented in Appendix-A.

Table 6.

Details of the prime-target sets 1 (Turkish)

Primes	Mean Number of Letters (Range)		Mean Number of Syllables	
	Prime	Target	Prime	Target
Morphologically Related –lI	6,77 (6-7)	4.77 (4-5)	3	2
Morphologically Related –sIz	7,66 (7-8)	4.66 (4-5)	3	2
Unrelated	4.72 (4-5)	4,72 (4-5)	2	2

To be sure that no participant encountered the same target more than once in one single session, the 54 critical prime-target pairs (9 morphologically related –lI, 9 morphologically related –sIz, 18 identical and 18 unrelated) were distributed over three versions. As a result, each version of the experiment included 18 critical prime-target pairs which were composed of 6 morphologically related, 6 identical and 6 unrelated prime-target pairs. As a consequence of this distribution, participants did not see a target more than once in each version of the experiment. For example, in the first version of the experiment, the target word *SINIR* 'limit' is primed by the morphologically related prime word *sınırlı* 'limited'. However, in the second version, the same target word *SINIR* 'limit' appears after it is primed by the identical word *sınır* 'limit'. The unrelated prime *melek* 'angel', in the third version of the experiment, appeared before the target word *SINIR* 'limit'. Therefore, the same target (*SINIR* 'limit') is not presented more than once in each version. This procedure was necessary to avoid repeated targets in each session. Table 7 presents the number of critical items after they are distributed into three different versions.

Table 7.

Number of critical experimental items preceded by different primes across 3 versions of the experiment

	Version 1	Version 2	Version 3
Morphologically Related –lI	3	3	3
Morphologically Related –sIz	3	3	3
Identity	6	6	6
Unrelated	6	6	6
Target	18	18	18

To clarify more, each version of the experiment included 18 critical prime-target pairs, 6 of which included identical pairs (e.g., *dalga - DALGA,* 'wavy - WAVE'), 6 of which included test conditions (a derived word as a prime and a target (e.g., uykusuz-*UYKU*, 'sleepless - SLEEP') and 6 of them included control condition which is made up of an unrelated word and the target (e.g., *sefer - DALGA,* 'journey- WAVE').

In addition to the 18 critical prime-target pairs, a set of 36 prime target pairs were used as fillers in each version. These fillers or distracters were necessary in order not to make the participants predict the specific aim of the research and develop a strategy accordingly. These fillers consisted of 6 derived word/word pairs, 6 inflected word/word pairs, 12 identical word/word pairs, 12 unrelated word/word pairs.

In addition to the real words, nonwords had to be used to create a masked priming experiment in which participants would decide whether the strings of letters shown on the screen represented a real word or a nonword. Therefore, 54 nonword-nonword prime-target pairs (E.g., yofuk - ŞIVIR) were created for each version of the experiment. All nonwords were derived from existing words by changing their initial letter and a letter in the second syllable yielding phonotactically legal words in Turkish. For example, *topuk* 'heel' turned into 'yofuk' (nonword) to get a phonotactical nonword in Turkish. See Table 8 for sample fillers and nonwords.

Table 8.

Examples of fillers and nonwords in Turkish experiment

Prime-Target Pairs	**Prime**	**Target**
Multimorphemic word - word	*Koşar* (runs)	*KOŞ* (RUN)
Identical word - word	*Usta* (master)	*USTA* (MASTER)
Unrelated word - word	*Odun* (wood)	*HAIN* (TRAITOR)
Nonword ending in –sIz - nonword	Ecpetsiz	ECPET
Nonword ending in –lI - nonword	Yenfeli	YENFE
Nonword ending in pseudo suffix *-ark* - nonword	Pobunark	POBUN
Identical nonword - nonword	Famıt	FAMIT
Unrelated nonword – nonword	Yofuk	ŞIVIR

3.2.3.3 Items of Masked Priming Experiment in English

For the masked priming lexical decision experiment in English, similar to the Turkish experiment, the total number of critical items tested was 18. These critical test items were 9 adjectives derived with adjectival suffix *–ful* and 9 adjectives derived with -*less*. Both -*less* and *–ful* are added to nouns to form adjectives. The critical items were chosen according to their base and derived form frequency norms of SUBTLEX-US (Brysbaert & New, 2009).

Furthermore, the prime-target pairs of English experiment were chosen according to their word length (i.e. number of letters and number of syllables). The target words in the English experiment consisted of 1 syllable except the target word 'color' which had 2 syllables. The mean number of syllables in the target words was 1.05 and they were composed of 4 or 5 letters with a mean length of 4.62. Table 9 presents the mean frequencies and frequency ranges in detail. Although the number of letters in each critical item was similar, the words ending with *–less* had naturally one more letter than the items ending with the suffix *–ful* due to the length difference between these two suffixes.

Table 9.

The mean frequencies and frequency ranges of test items in English

Suffixes	Base (stem) frequency (range) of the primes	Whole-word (derived form) frequency of the primes	Frequency of unrelated primes	Frequency of Target words
Morphologically related *–ful*	50.53 (33-98)	5.49 (1-15)	50.58 (32-98)	50.53 (33-98)
Morphologically related *–less*	47.06 (20-81)	3.64 (1-9)	48.84 (20-80)	46.84 (20-81)

The unrelated primes had no obvious semantic relationship with the target (e.g., cream-FAITH). The number of common letters and phonemes in the unrelated primes and the targets was as low as possible. Among the entire prime - target sets only 8 sets had common letters. Table 10 demonstrates the range and the mean number of the letters, syllables, and the number of shared letters between the target and the prime (See Appendix-D for the whole list of test items.).

Table 10.

Details of the prime-target sets 2 (English)

Prime Types	Mean letter number (Range)		Mean syllable number (Range)		Mean number of shared letters with the target
	Prime	Target	Prime	Target	
Morphologically related *–ful*	7.67 (7-8)	4.67 (4-5)	2.11 (2-3)	1.11 (1-2)	1.22
Morphologically related *–less*	8.56 (8-9)	4.5 (4-5)	2.00 (2)	1.00 (1)	0.67
Unrelated	4.67 (4-5)	N/A	4.56 (4-5)	N/A	1

In addition to the critical prime-target pairs, a set of 36 fillers were prepared to be used in each version of the experiment. These filler sets consisted of 6 derived word/word pairs, 6 inflected word/word pairs, 12 identical word/word pairs, 12 unrelated word/word pairs. Similar to the Turkish masked priming experiment, English experiment also included 54 nonwords. See Table 11 for sample filler and nonword pairs. Most of the nonwords were created from existing words by changing their initial letters and another letter in the word making sure that the output yield phonotactically legal words in English. In addition, the internet site of http://www.cogsci.mq.edu.au/cgi-bin/nwsrch.cgi (retrieved 28th May 2014) was used to construct nonwords in English.

Table 11.

Examples of fillers and nonwords in English experiment

Prime-Target Pairs	**Prime**	**Target**
Multimorphemic word - word	Grows	GROW
Identical word - word	Weird	WEIRD
Unrelated word - word	Fool	DARK
Nonword ending in *–ful* - nonword	Wulkful	WULK
Nonword ending in *–less* - nonword	Praikless	PRAIK
Nonword ending in pseudo suffix *–du* - nonword	Skandu	SKAN
Identical nonword - nonword	Draca	DRACA
Unrelated nonword - nonword	Blut	TAID

3.3 Data Analysis

Three different types of data were collected for this study. The first set of data was composed of proficiency scores which were collected by means of OQPT. Based on the proficiency scores, participants were grouped into two. The OQPT scores were not used in any further data analysis other than grouping participants into proficiency levels.

The second data set was composed of the RTs of the participants to the derived words which were primed by three different categories of words. The RTs obtained through E-Prime were put into a merge and filtering process before they were transformed into Microsoft Excel and SPSS version 20 for further analysis. Prior to the analysis, the outliers and the incorrect responses were identified and eliminated from the data set and they were not used for further analysis. This process was done separately for each participant. To discard the outliers, the RTs above or below 3 standard deviations from the mean were identified and eliminated. Then, the mean RTs were calculated for each participant for three different prime types. Each participant's mean RTs for identical prime, unrelated prime and test prime with two levels consisting of *–ful* and -less in English and -*lI* and -*sIz* in Turkish were calculated.

The third set of data was collected from the reading fluency test which was scored manually and then keyed into Microsoft Excel like the other data sets. Microsoft Excel and SPSS version 20 were used to examine whether the collected data revealed significant results for the aim of the research.

Descriptive statistical analysis was carried out to obtain the means, standard deviations and the standard error means of the participants for the whole data set. Confirming that the data were distributed normally, a 2x3 and 3x3 Mixed Design Analysis of Variance (ANOVA) was conducted to see whether there was a significant difference among the participant groups and three test conditions of identity, morphologically related and unrelated. As for finding the relationship between reading fluency and priming scores, Pearson Correlation Coefficient was calculated.

CHAPTER 4

RESULTS

This study aimed to explore the morphological processing patterns of L1 Turkish-speaking learners of L2 English and compare them with the morphological processing patterns of English native speakers. The L2 group was also tested in their L1 Turkish via a corresponding masked priming task to investigate whether the same processing routes hold in the L1 and L2. Therefore, two masked priming visual lexical decision experiments were prepared and the RTs of the participants to multimorphemic words were measured for three different priming conditions.

Before the data analysis, incorrect responses and RTs beyond three standard deviations above and below the mean were identified and excluded from further analysis. The rates of incorrect responses and the outliers for each experiment are presented in the tables below.

Table 12.

Error and outlier rates in English and Turkish experiments

	Error Rate in %		Outlier Rate in %	
	English	Turkish	English	Turkish
Pre-Intermediate (n=35)	7.24	4.07	1.26	1.69
Upper-Intermediate (n=35)	4.55	3.65	1.79	1.53
Native Speakers of English (n=23)	0.64	-	2.13	-

The table above demonstrates that the rate of outliers is similar among three different participant groups in both experiments and they are quite low. Both of the L2 learner groups had less than 5% error rate in the Turkish experiment. However, in the English experiment, the pre-intermediate group had a higher error rate (7.24%) than the upper-intermediate group (4.35%) which could be explained as a natural result of the proficiency level. This is not unexpected given the pre-intermediate group's proficiency levels and the amount of exposure to English.

4.1 Results of Experiment 1

Experiment 1 aimed to identify the processing patterns of Turkish multimorphemic words with derivational suffixes *-lI* and *-sIz* through a masked priming experiment. The target words were primed by identical, unrelated and morphologically related derived words. The results are reported for two groups of Turkish EFL learners of two proficiency levels - pre-intermediate and upper-intermediate. It is important to note again that L2 English participants in this study were given a masked priming test both in their L1 and L2. This is to compare the processing patterns of these late L2 learners in their Turkish and English. Ultimately, the aim is to identify whether L2 processing patterns can be explained via L1 processing patterns. In the L1 Turkish experiment, only the L2 learners were tested. There is no monolingual Turkish native control group. Although it would have been interesting and revealing to have processing data from monolingual Turkish native speakers, such research question would fall out of the scope of the present study. It can be examined in further research. Here the aim is simply to obtain and compare L1 and L2 processing data from late L2 learners of English.

Mean RTs and standard deviations obtained from the Turkish masked priming experiment for three different priming conditions (identical, test and unrelated) and two groups (pre-intermediate and upper-intermediate) are presented separately for the Turkish suffixes *–lI* and *–sIz* below.

Table 13.

Mean RTs (in ms) and Standard deviations for the morphologically related –lI condition in Experiment 1 (Turkish)

	Pre-Intermediate		Upper-Intermediate	
Prime Type	Mean	Standard Deviation	Mean	Standard Deviation
Morphologically Related *–lI*	533.60	72.87	499.13	55.13
Identity	530.38	60.76	500.30	45.27
Unrelated	556.87	54.33	529.48	43.34

The results are also presented with a bar diagram below to illustrate the RT differences among the three conditions. The diagram shows that identity and morphologically related priming conditions revealed similar RTs which are different from the unrelated priming condition.

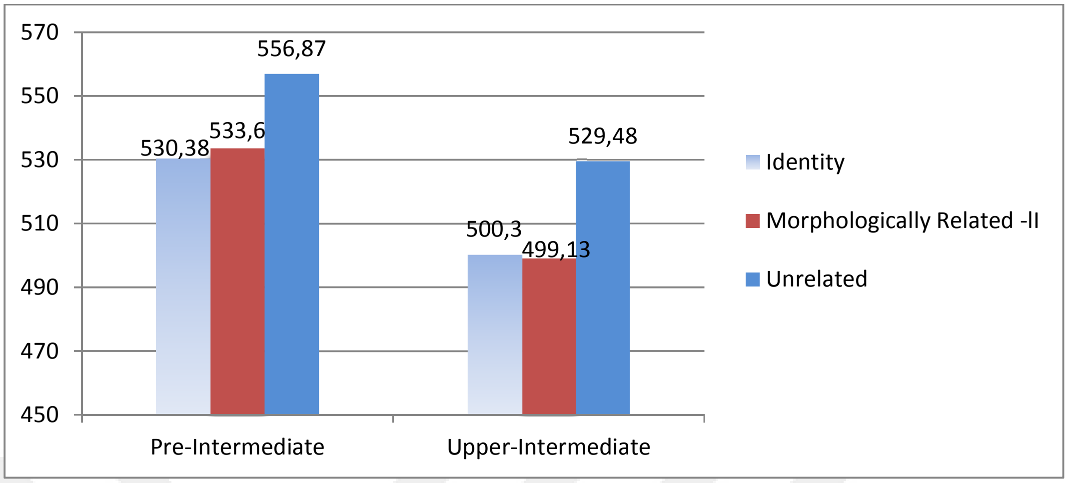

Figure 1. Mean RT (in ms) graph for the morphologically related –lI condition in Experiment 1 (Turkish)

Table 14 shows the mean RTs and standard deviations for the morphologically related *–sIz,* identity and unrelated conditions obtained from the Turkish masked priming experiment.

Table 14.

Mean RTs (in ms) and standard deviations for the morphologically related –sIz condition in Experiment 1 (Turkish)

	Pre-Intermediate		Upper-Intermediate	
Prime Type	Mean	Standard Deviation	Mean	Standard Deviation
Morphologically Related –sIz	530.82	75.00	489.03	45.42
Identity	517.17	63.24	483.93	39.08
Unrelated	565.39	61.51	524.55	51.87

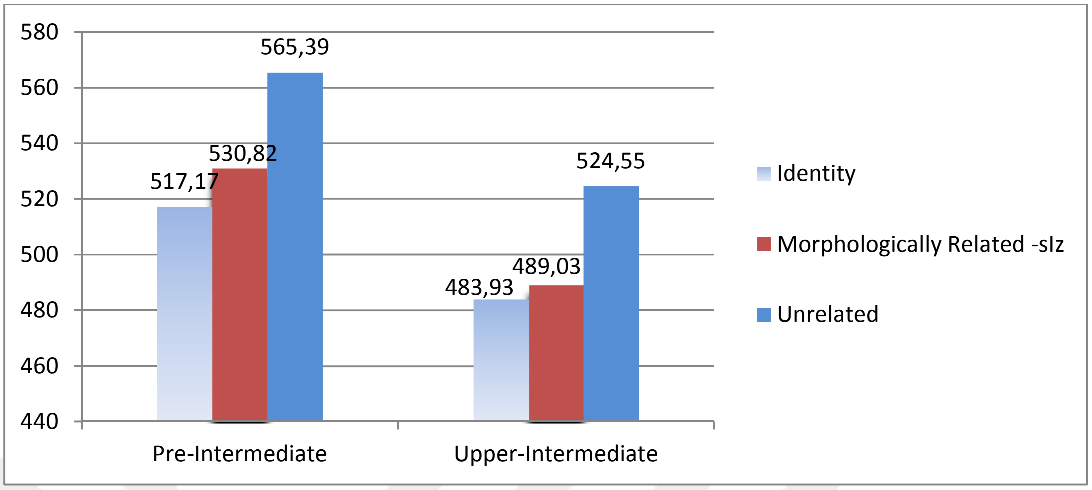

Figure 2. Mean RT (in ms) graph for the morphologically related –sIz condition in Experiment 1 (Turkish)

The mean RTs given to three different priming conditions are listed from the longest to the shortest as follows: unrelated > morphologically related *–sIz* > identity. The RTs given to the morphologically related *–sIz* and identity conditions are not as close to each other as they were in the morphologically related *–lI* condition. Yet, the mean RTs given to the unrelated condition are higher than the identity and the morphologically related conditions. Given that RTs to the target items in Tables 13 and 14 are shorter in the identity condition than unrelated condition shows that the priming test works and there are identity priming effects. Also, the shorter RTs in both test conditions (i.e. morphologically related conditions) than unrelated conditions suggest that there is morphological priming. In other words, seeing a morphologically related prime (e.g. *ücretsiz*) prior to the target noun (e.g. *ücret*) facilitates its recognition. This can only be possible only if there is morphological segmentation of the complex prime into stem (*ücret*) and derivational morpheme (*-siz*).

When the mean RTs and SDs of the two groups of L2 English learners are compared for both of the morphologically related *–lI* and *–sIz* conditions, it can clearly be seen that overall the pre-intermediate group has higher mean RTs, which suggests that this group is slower than the upper-intermediate group in responding to the target items in the L1 Turkish masked priming experiment. In terms of SDs, the values for the pre-intermediate group are higher than those of upper-intermediate group. With regard to the size of the priming effect, which is calculated by subtracting the RTs given to the morphologically related conditions form the unrelated condition, there is almost no difference between the two participant groups (Pre-Intermediate=34.57; Upper-Intermediate=35.52). The question of whether or not these priming size differences are significant is discussed below based on the statistical analysis carried out.

Several statistical tests were carried out on the variables before the main effect of prime type was analyzed. In this respect, the Kolmogorov-Smirnov test was used to confirm that the RTs for each of the variables were normally distributed (p>.005). This normality test was carried out because it is an underlying assumption that needs to be met when using parametric tests. The Kolmogorov-Smirnov test confirms that the RTs for each of the variables were normally distributed both for the morphologically related *–lI* (p=.675) its identity (p=.915) and unrelated (p=.555) conditions. Similarly for the morphologically related *–lI* (p=.809) its identity (p=.691) and unrelated (p=.377) conditions were also found to be distributed normally based on the p values obtained from the Kolmogorov-Smirnov test.

Homogeneity of variance was also tested with Levene's test for the Equality of Error Variances. The results of this test indicated that homogeneity of variance could be assumed. The data for the Turkish masked priming experiment was analyzed by a 2 (groups) x 3 (prime type) Mixed ANOVA. The results are presented in the ANOVA table below.

Table 15.

2 (Group) x 3 (Prime type) Mixed-design ANOVA on morphological processing of derivational suffix –lI

Source	SS	df	MS	F	p=
Between Subjects					
Group	49301.599	1	49301.599	6.331	.014
Error (between)	529523.569	68	7787.111		
Within Subjects					
Prime Type	34876.994	2	17438.497	20.816	.000
Prime Type x Group	445.810	2	222.905	.266	.767
Error (Within)	113933.327	136	837.745		

This analysis of variance of RTs yielded a statistically significant group effect, F=6.331, p=.014 in addition to a statistically significant prime type effect, F=20.816, p=.000 and a non-significant interaction between the group and the prime type, F=0.266, p=.767 for the Turkish derivational suffix *–lI*.

The data for the Turkish derivational suffix *–sIz* was also analyzed by a 2 (groups) x 3 (prime type) Mixed ANOVA. The results of ANOVA are presented in Table 16 below.

Table 16.

2 (Group) x 3 (Prime type) Mixed-design ANOVA on morphological processing of derivational suffix –sIz

Source	SS	df	MS	F	p=
Between Subjects					
Group	78304.753	1	78304.753	8.708	.004
Error (between)	611475.886	68	8992.292		
Within Subjects					
Prime Type	76757.113	2	38378.556	59.253	.000
Prime Type x Group	768.154	2	384.077	.593	.554
Error (Within)	88088.221	136	647.708		

This analysis of RTs revealed a statistically significant group effect, *F*=8.708, *p*=.004 in addition to a statistically significant prime type effect, *F*=59.253, *p*=.000 and a non-significant interaction between the group and the prime type, *F*=0.593, *p*=.554

With regard to prime types, unrelated prime condition triggered the longest RTs, whereas the identical prime led to the shortest RTs. The test condition primes (i.e. morphologically-related primes) led to RTs similar to those in the identity prime condition but faster RTs than the unrelated primes for both of the derivative suffixes, *–lI* and *–sIz*. In other words, the RT difference between the identical and the test prime condition was not as high as it was for the difference between unrelated and test prime condition. The RTs of the test prime conditions were much closer to the identical prime condition for the upper-intermediate group than the pre-intermediate level participants. At this point it is necessary to note again that morphologically primed target words are expected to be recognized faster than the targets primed by unrelated words in order to ensure that a priming effect is obtained. The results of ANOVA confirm a similar pattern of RTs which could be shown as an evidence of morphological decomposition of multimorphemic words. A profile plot diagram obtained by means of SPSS is presented below to illustrate the results and the pattern of morphological processing based on the identity, morphologically related and unrelated conditions.

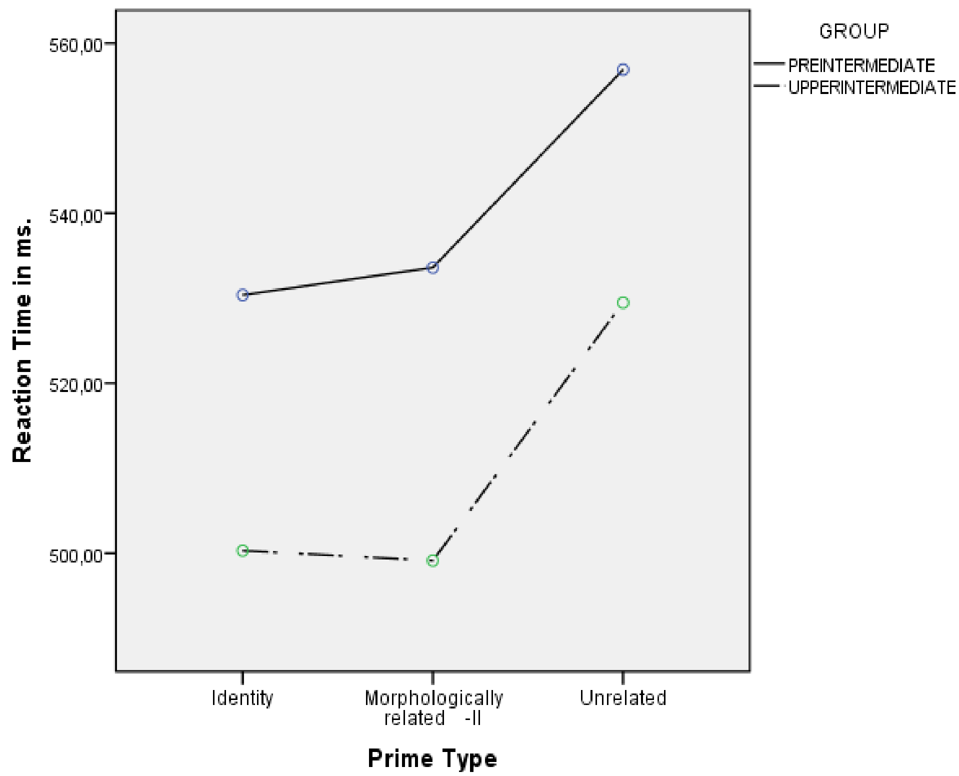

Figure 3. RT differences between the two proficiency groups in Experiment 1 (L1 Turkish test for suffix -lI)

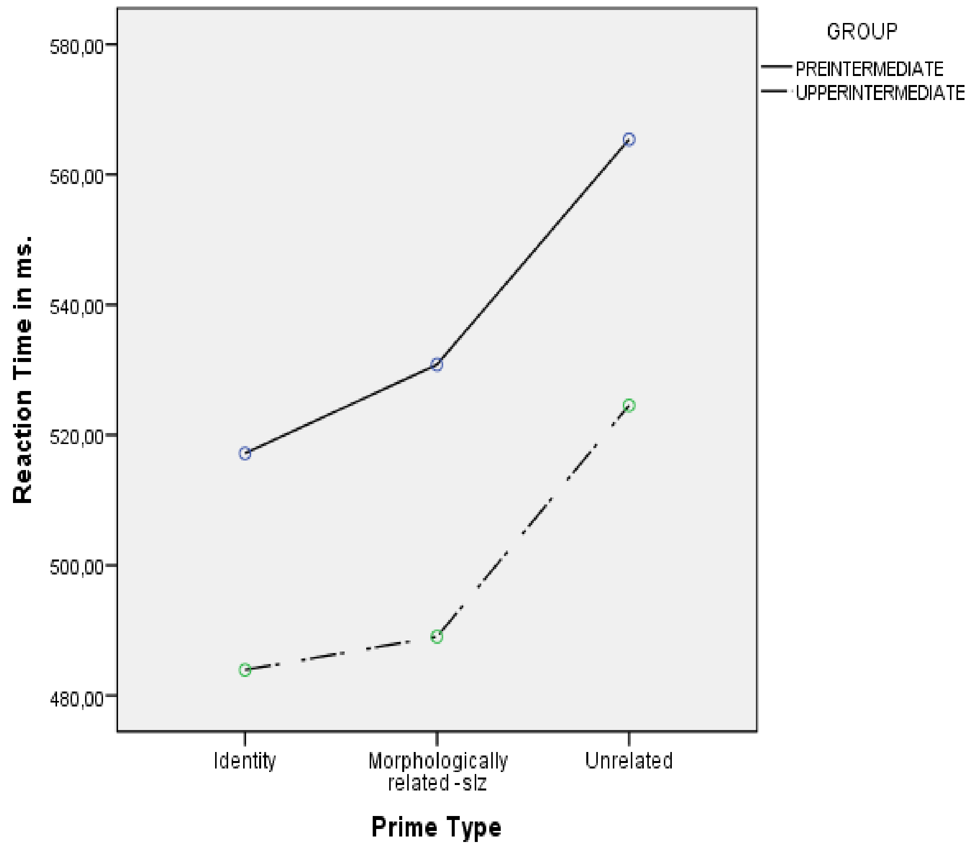

Figure 4. RT differences between the two proficiency groups in Experiment 1 (L1 Turkish test for suffix -sIz)

Figure 3 and 4 show the profile plot diagram obtained via ANOVA. The RT difference between the two L2 learner groups is presented for three different prime conditions. It can be seen that overall the mean RTs of the upper-intermediate group was shorter than the pre-intermediate group, yet as the diagram demonstrates the processing pattern in these two groups was not different. Nevertheless, what is crucial for us is that both groups have a similar pattern of RTs in three different prime conditions.

The pairwise comparisons of ANOVA revealed that the RTs obtained in the morphologically related *–lI* and identical conditions were not significantly different for the pre-intermediate and the upper-intermediate groups with a mean difference of 3.217 (p=.275) and 1.174 (p=.678) respectively. On the other hand, the mean RTs of unrelated and the morphologically related *–lI* was found to be significant with a mean RT difference of 23.278 (p=.013) for the pre-intermediate and with a mean RT difference of 30.347 (p=.001) for the upper-intermediate group.

Similarly; according to the pairwise comparisons, the mean differences between the morphologically related *–sIz* and identity condition were not significant either for the pre-intermediate or the upper intermediate group with a mean difference of 13.651, (p=.636) and 5.103, (p=1), respectively. On the other hand, the mean RTs of unrelated and the morphologically related *–sIz* was found to be significant with a mean RT difference of 34.571 (p=.000) for the pre-intermediate and with a mean RT difference of 35.522 (p=.000) for the upper-intermediate group.

Based on these figures, the RTs obtained for the unrelated condition in both groups were equally higher than those obtained in the test and identical conditions. This means that both groups demonstrate a pattern of 'Identity = Test < Unrelated' which indicates full priming in the L1 Turkish. In other words, L2 participants seem to decompose the stem + derivational suffix combination in accessing the complex words in their L1 Turkish.

The findings of the Turkish masked priming experiment carried on two suffixes of *–lI* and *–sIz* suggest that L1 Turkish–speaking learners of L2 English seem to decompose morphologically complex (derived) words into their constituent morphemes. Therefore, it can be asserted that Turkish native speakers of L2 English learners decompose the constituents (i.e. morphemes) of derived words before their lexical access. It was also observed that L2 English levels of the participants did not have any significant effect on the processing pattern of multimorphemic words in their L1 Turkish. Slightly shorter RTs of the upper-intermediate group could be explained by an overall enhanced cognitive processing capacity of this group.

4.2 Results of Experiment 2

Experiment 2 aimed to find the morphological processing pattern of late L2 learners while processing English multimorphemic words derived with suffixes *–ful* and *–less* via a masked priming experiment. In addition to the two participant groups who took part in Experiment 1, this experiment also involved a group of native English speakers as a baseline. Similar to the first experiment, the target words were primed by identical, unrelated and derived words. Descriptive statistics such as mean RTs and SDs for these three groups are presented in Tables and bar diagrams separately for the two morphemes *–ful* and *–less*.

Table 17.

Mean RTs (in ms) and standard deviations for the morphologically related –ful condition

	Pre-Intermediate Group		Upper-Intermediate Group		L1 English Native Speakers	
Prime Type	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
Morphologically Related –*ful*	587.84	79.06	525.14	51.72	606.32	93.30
Identity	583.84	95.28	506.12	63.01	591.49	93.36
Unrelated	642.92	91.09	562.17	62.62	624.30	111.72

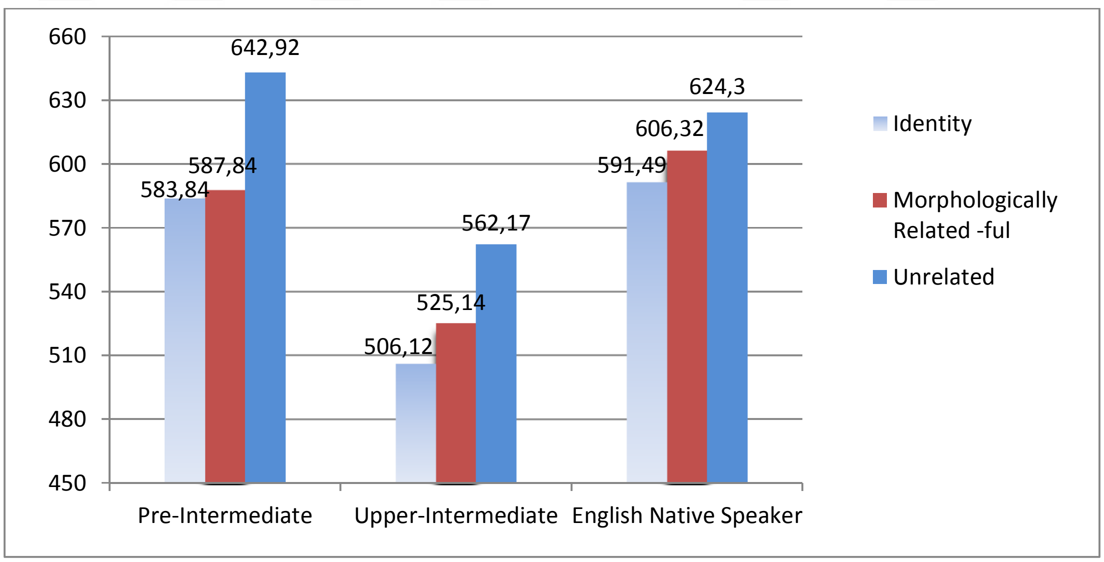

Figure 5. Mean RT (in ms) graph for the morphologically related –ful condition

As it is demonstrated in the table and the figure, the unrelated prime condition triggered the highest RTs, which means that the recognition time for the unrelated words was longer than that of identity and of the morphologically related condition for all of the participant groups. The mean RT difference between the identity and the morphologically related condition was very low for the pre-intermediate group; however the mean RT difference was larger for the same conditions of the upper-intermediate and the English native speaker group. Yet the difference in the mean RTs has to be statistically analyzed to confidently say whether they indicate a significant difference or not. Mean RTs and SDs are presented in the table and graph for the morphologically related –less condition below.

Table 18.

Mean RTs (in ms) and standard deviations for the morphologically related –less

	Pre-Intermediate Group		Upper-Intermediate Group		L1 English Native Speakers	
Prime Type	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
Morphologically Related *–less*	604.45	82.15	531.51	53.73	606.17	96.69
Identity	589.37	97.90	510.54	53.62	586.77	75.20
Unrelated	630.81	80.86	563.26	65.82	620.83	95.77

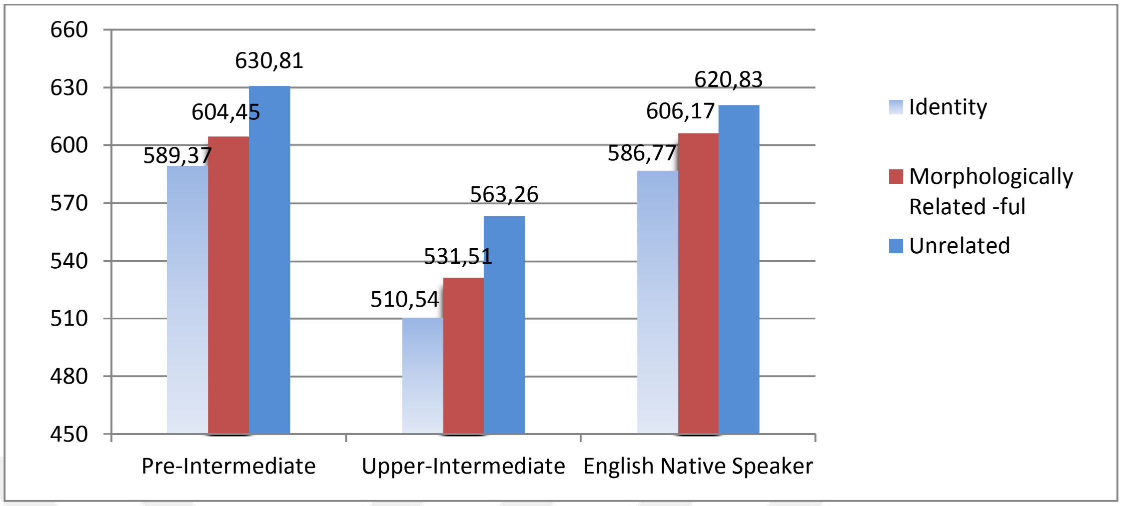

Figure 6. Mean RT (in ms) graph for the morphologically related –less condition

In terms of mean RTs, the upper-intermediate group was the fastest group across all three priming conditions. As for the results of pre-intermediate group, their RTs are closer to that of native speakers' rather than the upper-intermediate group. In other words, the pre-intermediate group showed RT latencies similar to those of the native speakers.

In terms of an overall processing pattern, across all three groups of participants, the highest mean RTs was obtained in the unrelated prime condition while the identical prime condition triggered the lowest RT for all participant groups. Recall that the morphological processing patterns of the participants are identified according to the differences among the mean RTs across three different prime conditions. While a pattern such as Identity Condition = Test Condition < Unrelated Condition would imply full priming, a pattern such as Identity Condition < Test Condition < Unrelated Condition would indicate partial priming. Crucially, for us to be able to say that there is priming (i.e. decompositional pattern), we would need to see a pattern such as Test Condition < Unrelated Condition in which target word recognition is faster after a morphologically-related prime than after an unrelated prime.

Whether the mean RTs given above are significant, further statistical analyses were conducted. Similar to the Experiment 1, several tests were carried out on the variables before the main effect of prime type was analyzed. One of these tests was the Kolmogorov-Smirnov test to confirm that the RTs for each of the variables were normally distributed both for the morphologically related *–ful* (p=.590) its identity (p=.234) and unrelated (p=.116) conditions. Similarly the same test confirmed that the data for the morphologically related *–less* (p=.298) its identity (p=.242) and unrelated (p=.935) conditions were normally distributed.

Levene's test for the Equality of Error Variances was also conducted. Levene's test for the Equality of Error Variances (p=.012, p=.081, p=.009 for the morphologically related *–ful*, identity and unrelated conditions respectively) revealed that homegenity of variance should be assumed for the morphologically related *–ful*, and its unrelated conditions. On the other hand, Levene's test for the Equality of Error Variances for the morphologically related *–less* (p=.004), its identity (p=.009) and unrelated (p=.215) conditions revealed that homogeneity of variance should be assumed for the morphologically related *–less*, and its identity condition.

The data for the English experiment was analyzed by a 3 (Group) x 3 (Prime Type) Mixed ANOVA separately for the two morphologically related *–ful* and *–less* conditions. The results are presented in an ANOVA table below.

Table 19.

3 (Group) x 3 (Prime type) Mixed-design ANOVA on morphological processing of derivational suffix –ful

Source	SS	df	MS	F	p=
Between Subjects					
Group	365814.016	2	182907.008	10.810	.000
Error (between)	1522825.296	90	16920.281		
Within Subjects					
Prime Type	117382.935	2	58691.467	35.475	.000
Prime Type x Group	11416.674	4	2854.169	1.725	.146
Error (Within)	297799.390	180	1654.441		

A two-way analysis of variance for level (pre-intermediate, upper-intermediate, native speakers of English) and prime type (identity, morphologically related *–ful*, unrelated) did not show any interaction effect between the factors, F (4,180) = 1.725,

p= .146. However, the same analysis of variance showed main effect of group, F (2, 90) = 10.810, p= .000, and prime type, F (2, 90) =35.475, p= .000.

The Bonferroni adjusted pairwise comparisons revealed that the overall mean RT difference between the pre-intermediate and the upper-intermediate group with a value of 73.722 turned out to be significant (p=.001). In addition, the mean difference between the upper-intermediate and the native speaker groups indicated significance with a mean difference of 76,226, (p=.001). On the other hand, the mean difference of RTs between the pre-intermediate and the native speakers of English was not found to be significant with a mean difference of 2.504 (p=1.000).

With regard to prime types, overall mean RTs between prime types of morphologically related *–ful* and unrelated conditions with a value of 36.693 turned out to be significant (p=.001). Therefore, the unrelated condition yielded significantly higher RTs than the morphologically related *–ful* condition. In addition, the difference of mean RTs between the unrelated and the identity condition also turned out to be significant with a value of 49.310, (p=.000). The mean RT difference between the identity and morphologically related *–ful* condition did not indicate any significant mean difference with a value of 12.617 (p= .142). Based on these results, it can be asserted that a pattern of "Identity condition = Morphologically Related Condition < Unrelated condition" occurred. Yet, since these results are based on the overall RTs of the three participant groups, further analyses were conducted separately for each group and prime type condition. Therefore Bonferroni adjusted pairwise comparisons found as a result of a 3 x 3 Mixed design ANOVA are presented below.

Table 20.

Pairwise comparisons of RTs given to identity, morphologically related –ful and unrelated conditions

	Morphologically related–*ful* - Identity		Unrelated - Morphologically related–*ful*		Unrelated-Identity	
	Mean Difference	Sig.[b]	Mean Difference	Sig.[b]	Mean Difference	Sig.[b]
Pre-Intermediate	3.998	1.000	55.075*	.000	59.073*	.000
Upper-Intermediate	19.021	.183	37.027*	.000	56.048*	.000
Native Speakers of English	14.832	.700	17.977	.346	32.810*	0.270

*The mean difference is significant at the .05 level.
b. Adjustment for multiple comparisons: Bonferroni

The results of Bonferroni adjusted pairwise comparisons signify that a processing pattern of "Identity Condition = Test (morphologically related *–ful*) < Unrelated Condition" is obtained for the pre-intermediate and the upper-intermediate groups. On the other hand, the processing pattern of native speaker group was found to signify a repetition priming which is based on the pattern of "Identity Condition < Unrelated Condition". These results suggest that Turkish L2 learners of English at two different proficiency levels decompose multimorphemic words regardless of their proficiency levels. However, native speakers of English show only repetition priming rather than full or partial priming. Yet, although it is not significant, a mean RT difference of 17.977 point between the unrelated and the morphologically related *–ful* condition of the native speakers of English shows a tendency for morphological decomposition. Actually, the nonsignificant mean RT differences of unrelated and the morphologically related *–ful* condition of native speakers of English could be due to the small sample size as the participant number of this group (n=23 was less than the pre-intermediate (n=35) and upper-intermediate (n=35) groups.

The data for the English derivational suffix –less was also analyzed by a 3x3 (Group: native speakers, pre-intermediate and upper-intermediate; Prime Type: identity, test and unrelated) Mixed ANOVA. Results or ANOVA are presented below.

Table 21.

3(Group) x 3 (Prime type) Mixed-design ANOVA on morphological processing of derivational suffix –less

Source	SS	df	MS	F	p=
Between Subjects					
Group	336916.523	2	168458.262	11.354	.000
Error (between)	1335336.367	90	14837.071		
Within Subjects					
Prime Type	87407.720	2	43703.860	24.604	.000
Prime Type x Group	4560.346	4	1140.086	.642	.633
Error (Within)	319732.406	180	1776.291		

Two way analysis of variance for level (pre-intermediate, upper-intermediate, native speakers of English) and prime type (identity, morphologically related *–less*, unrelated) did not show any interaction effect between the factors, F (4,180) = .642, p= .633. Yet, the same analysis of variance showed main effect of group, F (2, 90) = 11.354, p= .000, and prime type, F (2, 90) =24.604, p= .000.

The results of Bonferroni adjusted pairwise comparisons revealed that the overall mean differences of RTs between the pre-intermediate and the upper-intermediate group turned out to be significant with a value of 73.107 (p=.000). In addition, the mean RT differences of the upper-intermediate and the native speaker groups indicated significance with a mean difference of -69.485 (p=.001). On the other hand, the mean difference of RTs between the pre-intermediate and the native speakers of English was not found to be significant with a mean difference of 3.623 (p=1.000).

With regard to prime types, overall mean RTs between prime types of morphologically related *–less* and unrelated conditions with a value of 24.259 turned out to be significant (p=.001). Therefore, the unrelated condition yielded significantly higher RTs than the morphologically related *–less* condition. In addition, the difference of mean RTs between the unrelated and the identity condition also turned out to be significant with a value of 42.742, (p=.000). The mean RT difference between the identity and morphologically related *–less* condition did not indicate any significant mean difference with a value of 18.842 (p= .003). Based on these results, it can be asserted that a pattern of "Identity condition < Morphologically Related Condition < Unrelated condition" occurred. Different from the results of morphologically related *–ful* condition, the results of morphologically related *–less* condition signify a partial priming pattern rather than a full priming pattern. Yet, since these results are based on the overall RTs of the three participant groups, RTs were analyzed separately for each group and prime type condition. Therefore Bonferroni adjusted pairwise comparisons found as a result of 3 x 3 Mixed design ANOVA are presented below.

Table 22.

Pairwise comparisons of RTs given to identity, morphologically related –less and unrelated conditions

	Morphologically related–*less* - Identity		Unrelated - Morphologically related –*less*		Unrelated-Identity	
	Mean Difference	Sig.[b]	Mean Difference	Sig.[b]	Mean Difference	Sig.[b]
Pre-Intermediate	15.082	.260	26.355*	.037	41.437*	.001
Upper-Intermediate	20.964	.054	31.757*	.008	52.721*	.000
Native Speakers of English	19.400	.223	14.667	.759	34.067*	.040

*The mean difference is significant at the .05 level.

b. Adjustment for multiple comparisons: Bonferroni

Similar to the results of derivational morpheme –*ful*, the results of Bonferroni adjusted pairwise comparisons for the derivational suffix –*less* signify a processing pattern of "Identity Condition = Test (morphologically related –*less*) < Unrelated Condition" for the pre-intermediate and the upper-intermediate groups. However the mean RT difference between the identity and the morphologically related –*less* condition with a *p* value of .054 signifies that the upper-intermediate group would also tend to show partial priming. However since the *p* value is not significant, the results were interpreted accordingly. Therefore it could be argued that both the pre-intermediate and upper-intermediate groups showed full priming in processing multimorphemic words derived with the suffix –*less*. On the other hand, the processing pattern of the native speaker group was found to signify a repetition priming pattern similar to the results of morphologically related –*ful* condition. These results suggest that, similar to the findings of the morphologically related –*ful* condition, Turkish L2 learners of English at two different proficiency levels decompose multimorphemic words regardless of their proficiency levels. Again similar with the results of morphologically related *–ful* condition, native speakers of English only showed repetition priming for the morphologicallay related *–less* condition.

To illustrate the processing pattern of multimorphemic words derived by *–ful* and *–less* a profile plot diagram obtained by means of SPSS is presented below. It summarizes the results and the pattern of morphological processing based on the identity, morphologically related and unrelated conditions.

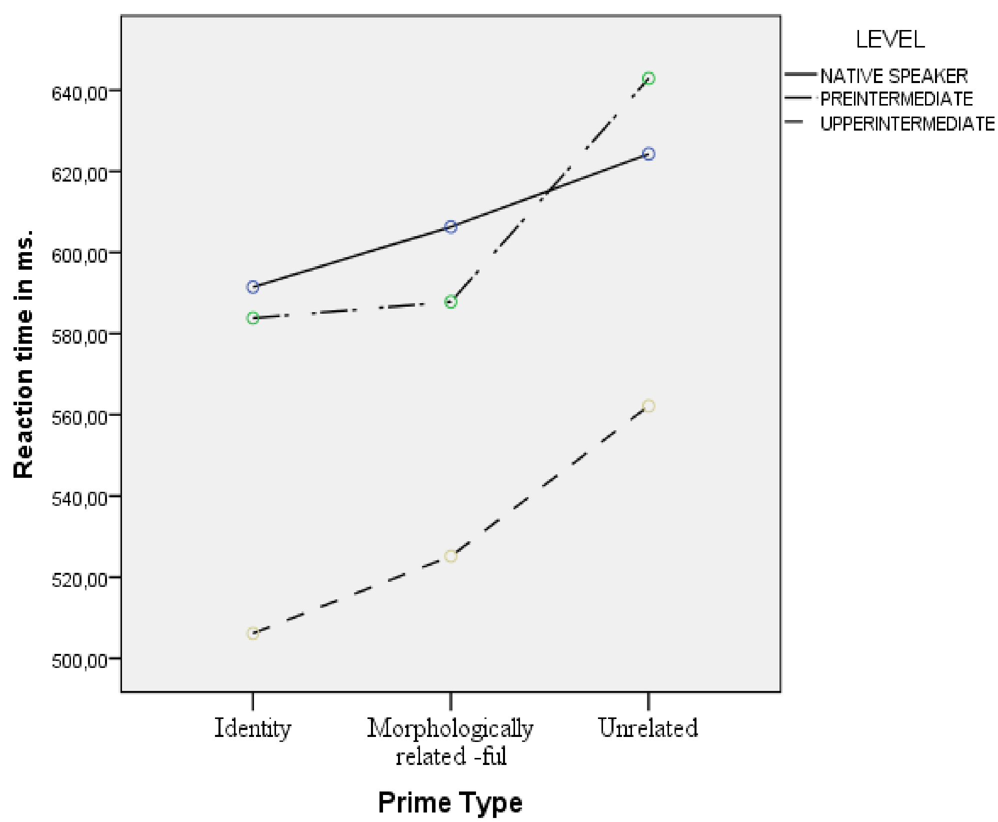

Figure 7. RT differences between the three proficiency groups in Experiment 2 (English test for suffix -ful)

According to the diagram, it is obvious that the morphological processing pattern of native speakers of English is different from that of pre-intermediate and upper-intermediate groups. The straight line representing the RTs of native speakers of English indicates a gradual increase in the RT of multimorphemic words from identity to the unrelated condition, yet the only significant difference is between the identity and the unrelated condition.

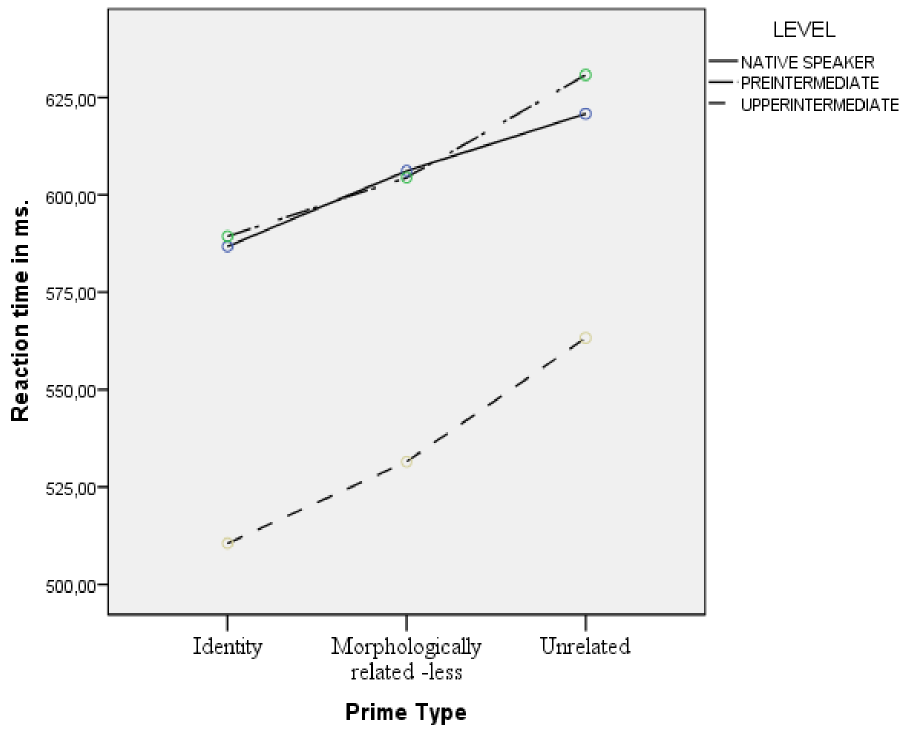

Figure 8. RT differences between the three proficiency groups in Experiment 2 (English test for suffix -less)

This profile plot diagram reveals a similar processing pattern for the pre-intermediate and the upper-intermediate group despite the fact that their RTs are quantitatively different. On the other hand native speakers' RT difference for the three prime conditions can be observed to be close to one another. That is why the analysis of variance did not reveal any significant results between the morphologically related and unrelated or identity condition.

4.3 Comparison of the Results of Experiment 1 and 2

Overall, the pre-intermediate group is found to be slower in reacting to the target words than the upper-intermediate group in both of the Turkish and English experiments. However, RT difference between these two groups is higher in the English experiment than the Turkish experiment. This may be considered as a natural consequence of the proficiency level difference of the two groups in L2 English. The RT difference between these two groups is not very notable in the Turkish experiment compared to the English experiment because they are exposed to Turkish from birth. The overall faster RTs of the upper-intermediate group may also be attributed to their general higher cognitive skills.

It is noteworthy that the SDs of the pre-intermediate group are higher than those of the upper-intermediate group in both experiments. This indicates that the pre-intermediate group has a large range between the lower and the upper bound of RTs than the upper-intermediate group. With regard to the error rate, the highest number of errors is observed for the unrelated prime conditions in both of the groups. In addition, the error rate of the pre-intermediate group is higher than that of the upper-intermediate group in both of the experiments.

On the basis of these findings, an overall conclusion can be made based on the results of the two masked priming experiments. Both of the L1-Turkish-speaking L2 English groups showed clear priming effects in the processing of English multimorphemic words. However, native English speakers indicated only a tendency to decompose multimorphemic words derived with the suffixes *–ful* and *–less*. This suggests that the processing pattern observed in L2 English learners is slightly different from that of native speakers of English. It is, however, important to note that native speakers of English still recognized the target words faster when they are preceded by morphologically related primes than unrelated primes, suggesting that there are, albeit less clear, facilitative effects of morphologically related primes on bare noun recognition. Nevertheless, given that native speakers of English, unlike the L2 groups, did not demonstrate full or partial priming in processing multimorphemic words, one can suggest that decompositional pattern is more salient in the L2 groups.

Similar to the results of the English masked priming experiment, the results of the Turkish masked priming experiment revealed full priming for both L1-Turkish L2_English participants with pre- and upper-intermediate L2 proficiency. Therefore, it can be concluded that these late bilinguals employ the decompositional route in processing both L1 Turkish and L2 English derived words. Native speakers of English, however, do not show clear decomposition in accessing words in their L1 English.

Although both Turkish and English have a rich derivational system, and they do not belong to the same language family. English is a Germanic Indo-European language and Turkish is an Altaic language with agglutinating morphological system. Given this rich derivational morphology in English and Turkish, it is not unexpected that the L2 groups employ decomposition (e.g. Bertram, Laine & Karvinen 1999; Hankamer, 1989) in both languages. In other words, if the decompositional processing pattern is due to the rich and productive derivational system in the language, then it is not surprising to find decompositional access route in English and Turkish. This is exactly what is found in the L2 groups. What is surprising, however, is the finding that the decompositional pattern is not observed clearly in native speakers of English. In contrast, if the decompositional pattern is only an early processing strategy, which can develop into the automatic rapid whole-word representational pattern, then the absence of full priming (i.e. decomposition) in native English speakers in their L1 is not completely unexpected. In other words, being a native speaker of a derivationally rich language, English native speakers have already been automatized in processing complex words in English hence the absence of complete decomposition (see also, Uygun & Gürel, 2016 for similar findings). However, this time, the decompositional processing behavior of L2 learners in their L1 Turkish requires an explanation. Given the confines of the study, it is plausible to suggest that the absence of full priming (and mere repetition priming) in the native English group may have emerged due to the small sample size in this group. As noted earlier, the number of the native speakers was 23 whereas the number of pre-intermediate and the upper-intermediate group was 35. Thus, it is possible that priming effects were not obtained clearly and fully in this group.

As for the morphological processing in the L2, the results reveal that L1-Turkish-speaking late L2 learners of English in two different proficiency groups demonstrate priming effects. The processing pattern they demonstrate in the L2 is similar to the one in their L1 Turkish. Given that full priming effects are not observed in native English control group, the decompositional route that is observed in the L2 learners can be due to their L1 Turkish. In other words, there are L1 transfer effects in L2 processing.

Furthermore, it is interesting that no processing differences were found between pre-intermediate and upper-intermediate level English learners. This might be due to the fact that the proficiency differences between the groups were not as large as one might think despite the fact that the OQPT is a widely used standardized profiency test. It might be possible that the limited constructs that are being tested in the OQPT (certain grammatical aspects and reading comprehension) do not reveal the exact general proficiency levels of the participants Therefore, OQPT -based slight proficiency differences between the groups did not lead to large differences in their processing patterns. Future research with two groups of larger proficiency differences (e.g., pre-intermediate and high-advanced) might reveal such effects more clearly.

The results obtained from the two masked priming experiments are summarized in the table below.

Table 23.

Summary of the results of Experiments 1 and 2

	English Experiment		Turkish Experiment	
	-ful	*-less*	*-lI*	*-sIz*
Pre-Intermediate Group	Full Priming	Full Priming	Full Priming	Full Priming
Upper-Intermediate Group	Full Priming	Full Priming	Full Priming	Full Priming
Native Speakers of English	Repetition Priming	Repetition Priming	-	-

4.4 Results of Reading Fluency Test

As noted earlier, the reading fluency scores of the participants were obtained via the sub-test of the Woodcock Johnson Achievement Test Form C. The correct responses of the participants were counted, scored and transferred into the SPSS program. In order to find an answer to the third research question of “whether the way L2 learners process multimorphemic words with derivational suffixes relates to reading fluency in the L2 independent of their proficiency levels”, the reading fluency scores of the participants were compared with the priming magnitudes obtained in the priming tests. More specifically, the mean RT difference between the unrelated and the test condition was compared with the reading fluency scores. In other words, the question of whether reading fluency correlated with the extent of morphological priming effects was examined. For this purpose a Pearson product-moment correlation coefficient was computed to assess the relationship between the reading fluency and priming scores, which were calculated by subtracting the mean RTs in the morphologically related condition from the unrelated condition. In other words the difference between the RT of the unrelated prime condition and the test condition was taken as priming score (or priming magnitude score) following some recent studies (Gacan, 2014; Rızaoğlu, 2016). Below I discuss the reading fluency results.

The mean reading fluency scores of the three participant groups are presented in Table 24 and Figure 9. It is necessary to note here that the reading fluency scores given below are raw scores (i.e. they are calculated over 128 points), which are based on the number of items used to measure reading fluency.

Table 24.

Reading fluency scores in English

Participants	Mean Reading Fluency Scores*
Native Speakers	81.91
Pre-Intermediate Group	43.89
Upper-Intermediate Group	53.6

*Raw scores are based on 128 items.

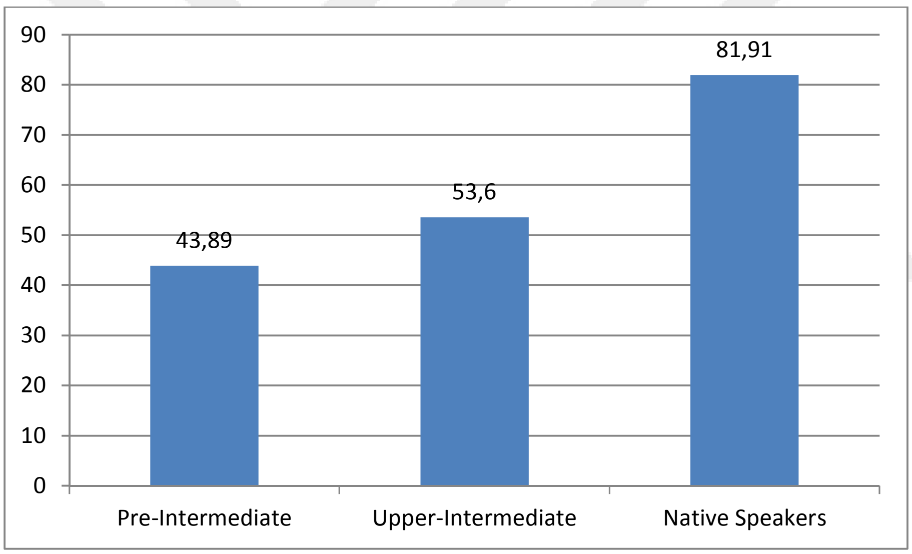

Figure 9. Mean reading fluency score graph

The analysis revealed that native speakers of English received the highest mean score with an average of 81.91, whereas the pre-intermediate group obtained the lowest score with an average of 43.89. The mean reading fluency score of the upper-intermediate group was 53.6. The differences between the mean scores of reading fluency were found to be significant. The results of one way ANOVA revealed a statistically significant group effect, $F(2,90)$=68.798, p=.000. According to the post- hoc analysis, the native speakers of English had the highest reading fluency score with a significant mean difference of 38.02 and 23.23 from the pre-intermediate and the upper-intermediate groups, respectively. The mean difference between the pre-intermediate and the upper-intermediate group (i.e. 14.714) was also significantly different.

4.5 Correlation between Reading Fluency and Morphological Processing Scores

Based on the research question "Does the way L2 learners process multimorphemic words with derivational suffixes relate to L2 reading fluency independent of their proficiency levels?", The Pearson Correlation coefficients were calculated for the pre-intermediate and the upper-intermediate group together. When no significant correlations were found, the same analysis was carried out separately for the two groups to see if any change would occur depending on the proficiency level. This analysis revealed only one significant negative correlation, which was between the priming scores obtained for the derivational suffix *–ful* and the reading fluency test scores of the pre-intermediate group ($r = -0.376$, $p=.026$, $n = 35$). This negative correlation indicates that the lower the priming score, the more fluent the reading is. To express in a different way, when the difference between the unrelated prime and the morphologically related prime (priming score) is low the reading fluency score gets higher. This implies that fluency in reading is accomplished when there is less decomposition. Since this result is obtained only for the processing of derivational suffix *–ful* by the pre-intermediate participants, it is difficult to argue about an overall correlation between reading fluency and morphological processing. Therefore, we cannot say that morphological processing scores correlate with reading fluency of L2 learners of English. The correlation results are presented in the table below. Although it is not directly related with the research question the results of the native speakers of English are also presented. Recall that native English speakers show less priming (less decomposition) but they are very fluent in reading in L1 English. This may suggest an intricate relationship between full-listing (i.e., whole-word access in word recognition) and fluent reading. Nevertheless, as noted above, within the confines of the study, this view cannot be fully substantiated. Further research is needed for this.

Table 25.

Correlation between reading fluency and morphological processing scores

Variable	Pre-Intermediate	Upper-Int	Native Speaker
Suffix *–ful*	-.376*	-.147	-.121
Suffix *–less*	-.139	-.123	-.126

Although the pre-intermediate group showed a significant correlation between the reading fluency and the priming score of derivational suffix *–ful*, a similar result was not revealed for the priming score of derivational suffix *–less*. This difference may be explained by the frequency difference between the derivational suffixes *–ful* and *–less*. Remember that the suffix *–ful* is more frequent than the suffix *–less*, and the effect of this frequency difference is obvious in the RT differences of these suffixes. As reported above the mean RT of *–ful* is 587.84 whereas the mean RT of *–less* is 604.45.

It is noteworthy to mention that the results of the Pearson correlation did not show any correlation between reading fluency and priming score of the upper-intermediate group for two derivational suffixes *–ful* and *–less*. This finding could be attributed to the relatively high reading fluency scores and lower RT difference between the unrelated and the morphologically related conditions of this group.

CHAPTER 5

DISCUSSION

5.1 Discussion on Morphological Processing

The first aim of the experiments carried out for this dissertation was to determine the extent to which pre-intermediate and upper-intermediate level Turkish EFL learners as well as native speakers of English would rely on morphologically structured representations (i.e. decompositional route) for derived word forms during online language processing. The second aim was to compare potential similarities and differences between the morphological processing of L1 Turkish and L2 English derived words in Turkish learners of English. The third and the final aim was to investigate potential correlations between the reading fluency scores and the morphological processing pattern (i.e. priming magnitude) to be able to relate morphological processing to reading fluency.

Via two masked priming experiments, one in English and one in Turkish, priming effects were examined. Each experiment included a Test condition comprising morphologically related prime-target pairs (e.g., careful - CARE) in addition to two control conditions of unrelated (e.g., angle - CARE) and the identity condition (e.g., care - CARE). According to the morphological processing literature, stem priming effects occur on the condition that; 1) the priming effect in the test condition (i.e. the condition where the prime and the target are morphologically related) cannot be attributed to purely formal or semantic factors; 2) the amount of priming in the test condition is equivalent to the amount of the priming in the identity condition (Silva & Clahsen, 2008). When these two conditions are met, one can say that there is morphological decomposition rather than whole word recognition in the processing of multimorphemic words.

Priming is a very complex issue and should be considered carefully for morphological processing because some orthographic and semantic factors might cause priming. In order to reduce the semantic factors and the effect of the orthographic similarity between the prime and the target, the primes are normally presented visually only for very briefly (for about 40-50ms) in masked priming experiments This brief SOA is reported to hinder facilitative effects of orthography and semantic similarity between prime words and targets (Diependaele et al. 2011; Silva & Clahsen, 2008). In light of previous research findings, the results of the present study can be interpreted in such a way that priming effects observed in the two experiments are not due the semantic and orthographic similarity between the prime and the target, but they are purely morphological. Nevertheless, future studies can also include additional prime conditions that contain primes that are semantically and/or orthographically related to targets to completely rule out the possibility that what looks like morphological priming is not due to orthographic or semantic relatedness between the prime and the target.

In highly inflected agglutinative languages such as Turkish, the lexical access of morphologically complex words are considered to involve “decomposition” rather than “full listing”, and this is explained by storage efficiency (Hankamer, 1989). Despite the fact that only two derivational suffixes are probed into with this study, the findings of Turkish masked priming experiment is in congruent with the prediction of Hankamer (1989). Turkish native speakers showed strong stem priming effects in the Turkish masked priming experiments. The results suggest that the agglutinative nature of Turkish might have played a role in the decomposition of Turkish multimorphemic words derived with the suffixes *–lI* and *–sIz*. Recall that similar decompositional processing patterns for derived words in Turkish were also reported in Kırkıcı and Clahsen (2013). Morphological decomposition was reported in the literature for non-agglutinative languages such as English (Diependaele et al., 2011; Silva & Clahsen, 2008) and German (Clahsen & Neubauer, 2010). Clahsen and Neubauer (2010) identified priming effects for the processing of multimorphemic derived words in German. Thus the current study supports the findings of the previous research that L1 derived words are decomposed into its constituent stem and suffixes before lexical access.

As for the proficiency-based differences in L2 processing, the results showed that the upper-intermediate group is faster in masked priming experiments; however, there was no significant difference between these groups in terms of processing patterns. This suggests that the proficiency level does not have a strong effect on morphological processing pattern. Furthermore, L2 learners may achieve decomposition although there is a general L2 proficiency-based increase in morphological processing.

Given that L2 learners display priming effects even at pre-intermediate proficiency level suggest that decomposition-based native-like processing pattern is possible for Turkish speaking L2 learners of English. Indeed, as mentioned in the methodology section, the mean length of exposure to L2 English was 5.4 and 6.7 years for pre- and upper-intermediate learners respectively. It is crucial that these learners all exposed to the L2 in a formal environment only. As the L2 exposure and instruction length increases, these participants are expected to achieve higher levels of L2 proficiency and consequently this will possibly lead to more native-like processing of L2 morphologically.

As for the mean age of first exposure to English is almost the same for both of the groups (pre-intermediate=10.45, upper-intermediate=10.38). A possible morphological processing pattern difference could have been observed if there had been a difference between the ages of first exposure to L2 English. Future research may look more closely into the role of age of onset differences on morphological processing in L2 learners.

As for the processing pattern in the L1, the learners revealed decomposition in their L1 Turkish as well. In other words, L2 learners demonstrate similar processing patterns both in L1 Turkish and L2 English. As for native speakers of English, the present study did not reveal full priming. This is somewhat surprising given that decomposition is commonly reported in English and given that there are views proposing decomposition for native speakers but full-listing for L2 learners (e.g. Clahsen et al., 2010). Thus, these findings are also in opposition with previous models such as Ullman's (2004, 2005) Declarative Procedural Model because in the present study late L2 learners unlike native speakers tend to demonstrate more decomposition. It is crucial to note that in these earlier views, the decompositional processing pattern is predicted for native speakers in processing inflectional morphology more than derivational morphology. Nevertheless, these models predict full-listing for late L2 learners in the processing of both derivational and inflectional morphology. This particular prediction has not been confirmed in the current study. In particular, given that L2 learners adopt morpheme-based decomposition in their L1 Turkish, the processing pattern of the native English speakers in English are puzzling. The absence of decomposition in native English speakers may be attributed to usage-based automatization of morphemic units. Thus fast decomposition may be relevant for native English speakers. Nevertheless, if full-listing is a characteristic of native speakers, then it should also appear in Turkish native speakers (Gürel, 1999).

To account for this, the role of L1 Turkish in L2 English processing could be discussed. In other words, given that native English speakers do not show full priming, the decompositional route in L2 English learners can be due to the decompositional pattern adopted in L1 Turkish., A common idea in processing interlanguage morphological processing studies is that L2 is affected by the linguistic properties of L1 (Koda, 2005; see also Uygun & Gürel, 2016). My prediction was based on the idea that L2 English processing could be affected by the linguistic and lexical structure of Turkish, which is mainly based on agglutination.

According to Clahsen & Felser (2006), learning a language in adolescence or adulthood is generally a difficult task and less successful when compared to learning a native language in childhood. Moreover, learning a foreign language in adolescence leads to less uniform linguistic systems which are considered to be affected by motivation and aptitude. Although this study searched merely for the difference between L1 and L2 English in terms of derivational suffixes, we can say that the findings are not completely in line with the shallow-structure hypothesis of Clahsen and Felser (2006) that suggests that when a second language is learned in adolescence it is not processed like L1.

5.2 Discussion on Reading Fluency

This study also aimed to search for a possible correlation between morphological processing and reading fluency of L2 learners. The results did not reveal clear relations between these two constructs. In other words, the correlation coefficients found between the priming scores and the reading fluency scores were not significant other than the correlation between the priming scores of pre-intermediate group for the derivational suffix *–ful*.

This result is not completely unexpected given the fact that the reading fluency test was composed of ordinary sentences that a person could encounter in his/her daily life rather than sentences that are composed of mainly derived words. That is, the test was not specifically designed to measure the reading fluency based on multimorphemic words. Furthermore, it is crucial to note that the measurement of lexical access was done in milliseconds. In other words, the priming experiments were carried out to identify real time lexical access, whereas the reading fluency was tested based on pen-and-paper test. Although both of the data collection materials were consistent, valid and reliable within themselves, their comparison may be problematic due to incomparable measurement instruments. As noted above, the reading fluency test could have been designed on the basis of isolated word lists including both affixed and bare forms and designed as a more sensitive test measuring the precise reading times. Nevertheless, this study used a standardized reading fluency test and avoided any kind of validity issues that might have otherwise emerged from using an innovative reading fluency test. What is meant here is that it might have been better to use two online testing measures rather than testing the morphological processing via an online paradigm and reading fluency via a pen-and-paper test.

With respect to group comparisons in terms of reading fluency scores, as mentioned in the results section, the mean reading fluency scores of native speakers, the upper-intermediate group and the pre-intermediate group were 81.9, 53.6, and 43.89 respectively. These results could be considered to be quite expected given the reading fluency literature. For example, Day and Bramford (1992, p.17) claim that "there is no essential difference between fluent L1 and L2 reading, and that fluent L2 reading necessitates a large vocabulary". In accordance with this idea, it can be claimed that the reading fluency difference among the three participant groups can be attributed to the differences in terms of vocabulary capacity (as part of proficiency) and/or word familiarity among the readers. It is certain that an L2 learner of English cannot have as many vocabulary items as a native speaker of English in their lexicon; similarly, the vocabulary capacity of pre-intermediate students is narrower than that of upper-intermediate level participants. Also, native and non-native groups may not have the same extent of familiarity for all the L2 words. It is important to note that lexical items in a language may have a particular frequency count but this does not necessarily mean that L2 learners encounter these L2 words to the same extent. Therefore, they might have different frequency and familiarity for these L2 words. This may vary depending on their L2 exposure and proficiency. Therefore, the fluency differences among the three groups in this study can be explained by vocabulary capacity and overall proficiency level.

As argued by Logan (1993) the reading fluency difference among the three groups can be explained on the basis of automaticity. Logan (1993. p. 128) notes:

> "novice performance may be slow, effortful, deliberate, and conscious, and highly practiced performance may be fast, effortful, autonomous, and unconscious. However, performance after an intermediate amount of practice may be somewhat fast, somewhat effortful, somewhat autonomous, and partially unconscious."

It is certain that native speakers have practiced reading in English much more than L2 learners and similarly the upper-intermediate group can be said to have done more hours of reading more than the pre-intermediate group. Therefore, the difference in the reading fluency of the three participant groups is not unpredicted, as suggested by Logan (1993).

It is also important to note that although the reading fluency test used in the study did not particularly target reading of multimorphemic words, it is plausible to assume that the decompositional processing pattern found in L2 English learners could have negatively influenced their reading fluency. It would have been revealing to identify the reading fluency performance of the L2 learners in their L1 Turkish. This would have helped us understand whether the decompositional route adopted in processing L1 Turkish words also negatively influence their reading fluency in Turkish. Further research can also look into this question.

5.3 Pedagogical Implications

Psycholinguistic studies attempt to find answers to the questions of how languages are processed and represented in the human mind. Although they would not be related to language teaching pedagogy directly, some implications can still be drawn based on the findings of the current study in reference to the specific research questions. The results of this study did not reveal a strong correlation between morphological processing and reading fluency. Yet it is important that morphological awareness should be raised during English language lessons because it is known that morphological processing, mainly morphemic decomposition which denotes the existence of morphological awareness, has a positive effect on reading comprehension and fluency (Carlisle, 2003a; Deacon & Kirby, 2004).

The result of masked priming experiments in this study revealed that the morphological processing patterns of L1 Turkish L2 learners of English depend on decomposition of multimorphemic English words, yet a slightly different result was obtained for the morphological processing of native speakers of English which could be attributed to the relatively small participant number. However, the research on morphological processing of multimorphemic words in English by native speakers of English are reported to show full priming effects.

Achieving native-like language processing can be viewed as an ultimate aim of foreign language teaching programs. However, this is not always possible since most of the English language learners are not exposed to sufficient written or auditory L2 input although they start learning English as young as 8 to 10 years of age. A similar problematic situation is also valid for the participants of this study. Although their first L2 English exposure age is around 10, most of them receive insufficient input (merely classroom-based limited input) due to heavy reliance on formal teaching and lack of natural input in middle schools in Turkey. However difficult it might be, L1 Turkish-speaking L2 English learners can still be trained and instructed so that they can achieve native-like morphological processing.

Classroom drills and practices that concentrate on the internal structure of words and that enhance morphological awareness in L2 learners can be the necessary steps in this direction. Increased metalinguistic awareness can gradually turn into automatic processing and this would enable L2 learners to do rapid decomposition in accessing morphologically complex words. This would eventually also increase fluency and accuracy in reading (comprehension). Morphological awareness, especially awareness for derivational morphology, could be accomplished by instructing how morphemes change the semantic meaning of a word as well as its form. This kind of instruction can be given when a new vocabulary item is encountered or introduced during an English lesson. Derived form of the words can be marked in the course books or written on one part of the board to create awareness. The stem and the derived form of the words can be written separately, but if there is a spelling change, it should be marked. As a result, students can come to know that the words written on a separate part of the board are derived words and they have different forms and meanings. In addition to above mentioned awareness tasks, students can be instructed to study closely some EFL or ESL vocabulary books that list affixes in separate sections and give examples of English derivational prefixes and suffixes. Needless to say, these types of metalinguistic awareness tasks require fully proficient L2 teachers that are knowledgeable about the subtle properties of morphological system of the L2 to be able to design the necessary classroom practices. Moreover, the awareness of ELT teachers on the role of morphological awareness on language teaching should also be raised.

5.4 Conclusion and Suggestions for Future Studies

The morphological processing studies carried out for this dissertation can be considered as a psycholinguistic investigation that attempts to identify the processing capacity of the human mind. Any kind of psycholinguistic study in general and morphological processing studies in particular would tell us something about the overall processing capacity for language. Therefore, the findings of this dissertation and similar experiments provide us with hints about how languages are processed in general. The experiments carried out for this dissertation can provide insights into how second or foreign languages are learned/acquired and how they should be taught. In this sense, the results of this dissertation imply that late L2 learners of English with Turkish as native language tend to decompose multimorphemic words as they do in their native language Turkish. Based on this finding it can be said that native language would have an effect on morphological processing of L2 which is English for this study. However, it is not certain whether identical results would be obtained if the participants started to acquire L2 English at an earlier or later age. Yet, it is not impossible for late L2 learners to achieve native-like processing in the domain of L2 morphology. Regardless of the proficiency level of the participants, late L2 learners can accomplish nativelike processing in the L2 particularly in the domain of derivational morphology. However, this conclusion needs to be verified by future studies. The role of early and late L2 exposure on L2 morphological processing can also be examined in future research. The age of first exposure indeed might influence the extent of native-like processing in the L2 as early L2 exposure normally suggests longer and more consistent L2 exposure and automatization in language decoding.

With respect to reading fluency, since the participants of this study were adolescent native speakers of Turkish and, therefore, they were assumed to be fluent in reading in Turkish. Nevertheless, as noted earlier testing reading fluency in the L1 could have provided us a bigger picture and possibility to compare reading fluency in the L1 and L2. Future research should include a separate measure of L1 fluency (as long as standardized test is also available in the L1). This would also enable us to examine potential correlations between morphological processing in the L1 and L1 reading fluency in comparison to corresponding L2 measures. Furthermore, a research design similar to the one used in this dissertation could be prepared to test the role of Turkish morphological processing in Turkish reading fluency for younger participants (i.e. literate primary school students). The participants of this study could be early literacy learners in K1 through K3 levels. Such research would also be very revealing in terms of the progressive nature of reading fluency as well as morphological processing patterns.

REFERENCES

Anglin, J. M. (1993). Vocabulary development: A morphological analysis. *Monographs of the Society for Research in Child Development 58(10)*.

Baayen, R. H., Dijkstra, T., & Schreuder, R. (1997). Singulars and Plurals in Dutch: Evidence for a parallel dual- route model. *Journal of Memory and Language 37 (1)*, 94-117.

Balcı, A. (2011). Morphology:The Wordland. In H. Yavuz, & A. Balcı, *Turkish Phonology and Morphology* (pp. 60-76). Eskişehir: Anadolu University.

Balota, D. A., Yap, M. J., & Cortese, M. J. (2006). Visual Word Recognition: The Journey from Features to Meaning (A Travel Update). In M. J. Traxler, & M. A. Gernsbacher, *Handbook of Pscyholinguistics* (pp. 285-375). London: Academic Press.

Bertram, R., Laine, M., & Katja, K. (1999). The Interplay of Word Formation Type, Affixal Homonymy, and Productivity in Lexical Processing: Evidence from a Morphologically Rich Language. *Journal of Psycholinguistic Research, Vol. 28, No. 3*, 213-226.

Bertram, R., Schreuder, R., & Baayen, R. H. (2000). The Balance of Storage and Computation in Morphological Processing:The Role of Word Formation Type, Affixal Homonymy, and Productivity. *Journal of Experimental Psychology:Learning, Memory, and Cognition Vol. 26, No. 2,*, 489-511.

Bickel, B., & Nichols, J. (2007). Inflectional morphology. In T. Shopen, *Language Typology and Syntactic Description* (pp. 169-239). Cambridge: Cambridge University Press.

Boudelaa, S., & Marslen-Wilson, W. (2005). Discontious morphology in time: Incremental masked priming in Arabic. *Language and Congitive Processes 20*, 207-260.

Brysbaert, M., & New, B. (2009). Moving beyond Kučera and Francis: A critical evaluation of current word frequencynorms and the introduction of a new and improved word frequency measure for American English. *Behavior Research Methods 41*, 977.

Brysbaert, M., & New, B. (2015, June 1). *University of Ghent Experimentele- Psychologie*. Retrieved from University of Ghent: http://www.ugent.be/pp/experimentele-psychologie/en/research/documents/subtlexus/subtlexus4.zip

Brysbaert, M., Lange, M., & Van Wijnendaele, I. (2000). The effects of age-of-acquisition and frequency-of-occurrence in visual word recognition:Further evidence from the Dutch language. *European Journal of Cognitive Psychology 12:1*, 65-85.

Butterworth, B. (1983). Lexical Representation. In B. Butterworh, *Language Production (Vol.2)* (pp. 257-294). San Diego, CA: Academic Press.

Caramazza, A., Laudanna, A., & Romani, C. (1988). Lexical Access and Inflectional Morphology. *Cognition 28*, 297-332.

Carlisle, J. F. (2000). Awareness of the structure and meaning of morphologically complex words: Impact on reading. *Reading and Writing 12*, 169-190.

Carlisle, J. F. (2003a). Awareness of the structure and meaning of morphologically complex words: Impact on reading. *Reading and Writing 12*, 169-190.

Carlisle, J. F. (2003b). Morphology Matters in Learning to Read. *Reading Psychology 24*, 291-322.

Carlisle, J. F., & Fleming, J. (2003). Lexical Processing of Morphologically Complex Words in Elementary Years. *Scientific Studies of Reading 7 (3)*, 239-253.

Carstairs-McCarthy, A. (2002). *An Introduction to English Morphology:Words and Their Structure.* Edinburg: Edinburg University Press.

Chang, A. C.-S. (2010). The effect of a timed reading activity on EFL learners:Speed, comprehension, and perceptions. *Reading in a Foreing Language Vol.22, No.2*, 284-303.

Clahsen, H. (2013). Morphological Processing. *Psycholinguistics*, 65-78.

Clahsen, H., & Felser, C. (2006). How native-like is non-native language processing? *Trends in Cognitive Sciences Vol.10 No.12*, 564-570.

Clahsen, H., & Neubauer, K. (2010). Morphology, frequency and the processing of derived words in native and nonnative speakers. *Lingua, 120*, 2627-2637.

Clahsen, H., Baklair, L., Schutter, J.-S., & Cunnings, I. (2013). The time course of morphological processing in a second language. *Second Language Research 29 (1)*, 7-31.

Clahsen, H., Felser, C., Neubauer, K., Sato, M., & Silva, R. (2010). Morphological Structure in Native and Non-Native Language Processing. *Language Learning 60*, 21-43.

Cole, P., Segui, J., & Taft, M. (1997). Words and Morphemes as Units for Lexical Access. *Journal of Memory and Language 37*, 312-330.

Day, R., & Bamford, J. (1998). *Extensive reading in the second language classroom.* Cambridge: Cambridge University Press.

Deacon, S. H., & Kirby, J. R. (2004). Morphological Awareness: Just "more phonological?" The roles of phonological and morphological awareness in reading development. *Applied Psycholinguisticss*, 223-238.

Diependaele, K., Dunabeitia, J. A., Morris, J., & Keuleers, E. (2011). Fast morphological effect in firs and second language word recognition. *Journal of Memory and Language, 64*, 344-358.

Ergin, M. (2011). *Türk Dil Bilgisi.* Istanbul: Bayrak Publishing.

Feldman, L. B., Kosti´c, A., Basnight-Brown, D. M., Filipovi´c Durdevi´c, D., & Pastizzo, M. J. (2010). Morphological facilitation for regular and irregular verb formations in native and non-native speakers: Little evidence for two distinct mechanisms. *Bilingualism: Language and Cognition, 13 (2),*, 119–135.

Feldman, S. M. (2009). *Essentials of Understanding Psychology (Eight Edition).* New York: McGraw Hill.

Fernandez, E. M., & Cairns, H. S. (2011). *Fundamentals of Psycholinguistic.* Singapore: Wiley-Blackwell.

Ford, M. A., Davis, M. H., & Marslen-Wilson, W. D. (2010). Derivational morphology and base morpheme frequency. *Journal of Memory and Language 63*, 117-130.

Forster, K. (1999). The Microgenesis of Priming Effects in Lexical Access. *Brain and Language 68,*, 5–15.

Forster, K., & Davis, C. (1984). Repitition Priming and frequency attenuation in lexical access. *Journal of Experiental Psychology:Learning, Memory, and Cognition, 10.*, 680-699.

Fraunfelder, U., & Schreuder, R. (1991). Constraining psycholinguistic models of morphological processing and representation: The role of productivity. In G. E. Booij, & J. van Marle, *Yearbook of morphology* (pp. 165-183). Dordrecht: Kluwer.

Frost, R., Forster, K. I., & Deutsch, A. (1997). What can we learn from the morphology of Hebrew? A masked-priming investigation of morphological representation. *Journal of Experimental Psychology: Learning, Memory, and Cognition 23*, 829-856.

Gacan, P. (2014). *The morphological processing of derived words in L1 Turkish and L2 English.* Unpublished MA Thesis. Middle East Technical University.

Göksel, A., & Keslake, C. (2005). *Turkish: A comprehensive Grammar.* London: Routledge.

Gor, K. (2010). Introduction. Beyond the Obivous: Do Second Language learners Process Inflectional Morphology. *Language Learning 60:1*, 1-20.

Grabe, W. (2009). *Reading in a second language: Moving from theory to practice.* New York: Cambridge University Press.

Gürel, A. (1999). Decomposition:To what extent? The case of Turkish. *Brain and Language 68*, 218-224.

Gürel, A., & Uygun, S. (2013). Representation of multimorphemic words in the mental lexicon: Implications for second language acquisition of morphology. In S.Baiz, N.Goldman, & H. R (Ed.), *Proceeding of the 37th Annual Conference on Language Development* (pp. 122-133). Somerville: Cascadilla Press.

Hankamer, J. (1989). Morphological parsing and the lexicon. In W. M. Wilson, *Lexical resprentation and process* (pp. 392-408). Cambridge, MA: The MIT Press.

Harley, T. A. (2001). *The Psychology of Language From Data to Theory.* Hove and New York: The Psychology Press.

Harris, T., & Hodges, R. (1995). *The Literacy Dictionary.* Newark, DE: International Reading Association.

Jeon, E. H. (2011). Contribution of Morphological Awareness to Second-Language Reading Comprehension. *The Modern Language Journal, 95, ii*, 217-235.

Katz, L., Brancazio, L., Irwin, J., Katz, S., Magnuson, J., & Whalen, D. H. (2011). What lexical decision and naming tell us about reading. *Reading Writing*, DOI 10.1007/s11145-011-9316-9.

Keiffer, M. J., & Lesaux, N. K. (2008). Contribution of morphological awareness to second-language reading comprhension of Spanish-spaking English language learners. *Reading Writing 21*, 783-804.

Keiffer, M. J., & Lesaux, N. K. (2010). Knowledge of words, knowledge about words: Dimensions of vocabulary in first and second language learners in sixth grade. *Reading Writing 25*, 347-373.

Kim, S. Y., Wang, M., & Ko, I. Y. (2011). The processing of derivational morphology in Korean-English bilingual readers. *Bilingualism:Language and Cognition 14(4)*, 473-488.

Kırkıcı, B., & Clahsen, H. (2013). Inflection and derivation in native and non-native language processing:Masked priming experiments on Turkish. *Bilingualism:Language and Cognition Volume 16 Issue 04*, 776-791.

Koda, K. (2000). Cross linguistic variations in L2 morphological awareness. *Applied Pscholinguistics 21*, 297-320.

Koda, K. (2005). *Insights into Second Language Reading: A Cross Linguistic Approach.* Cambridge: Cambrigde University Press.

Koda, K. (2007). Crosslinguistic Constraints on Second Language Reading Development. *Language Learning, 57*, 1-44.

Kornfilt, J. (1997). *Turkish.* London and New York: Routledge.

Kutlay, N. (in preparation). The processing of Morphology in adult second language acquisition. PhD Dissertation. Boğaziçi University.

Kunduracı, A. (2013) Turkish Noun-Noun Compounds: A Process Based Paradigmatic Account. PhD Dissertation submitted to Calgary University.

Lemhöfer, K., Dijkstra, T., Schriefers, H., & Baayen, R. H. (2008). Native Language Influences on Word Recognition in a Second Language: A Megastudy. *Journal of Experimental Psychology:Learning, Memory, and Cognition Vol. 34 No. 1*, 12-31.

Libben, G., & Jarema, G. (2002). Mental Lexicon Research in the New Millennium. *Brain and Language 81*, 2-11.

Libben, G., & Jarema, G. (2007). Introduction: Matters Of Definition And Core Perspectives. In G. Libben, & G. Jarema, *The Mental Lexicon: Core Perspectives.* Amsterdam: Elsevier Science.

Logan, G. D. (1997). Automaticity and Reading: Perspectives from The Instance Theory of Automatization. *Reading & Writing Quarterly: Overcoming Learning Difficulties, 13:2,*, 123-146.

Longtin, C.-M., & Meunier, F. (2005). Morphological decomposition in early visual word processing. *Journal of Memory and Language 53*, 26-41.

Macquarie University Cognitive Science Department. (2014, March 31). Retrieved from http://www.cogsci.mq.edu.au/cgi-bin/nwsrch.cgi

Mahony, D. (1994). Using sensitivity to word structure to explain variance in high school and college level reading ability. *Reading and Writing: An Interdisciplinary Journal, 6.*, 19–44.

Mahony, D., Singson, M., & Mann, V. (2000). Reading ability and sensitivity to morphological relations. *Reading and Writing: An Interdisciplinary Journal 12* , 191-218.

Marslen Wilson, W. D. (2007). Morphological Processes in Language Comprehension. In M. D. Gaskel, *Oxford Handbook of Psycholinguistics.* Oxford: Oxford University Press.

Marslen-Wilson, W., Tyler, K. L., Waksler, R., & Older, L. (1994). Morphology and Meaning in the English Mental Lexicon. *Psychological Review Vol.101, No. 1*, 3-33.

Naggy, W. E., & Anderson, R. C. (1995). *Metalinguistic awareness and literacy acquisition in different languages.* Chicago: Center for the Study of Reading,Technical Report No.618, University of Illınois.

Nation, I. S. (2005). *Learning Vocabulary in Another Language.* Cambridge: University Press.

National Reading Panel. (2000). Retrieved from http://www.nichd.nih.gov/publications/pubs/nrp/documents/report.pdf

Neubauer, K., & Clahsen, H. (2009). Decomposition of Inflected Words in a Second Language. *SSLA, 31*, 403-435.

Nunes, T., Bryant, P., & Bindman, M. (1997a). Learning to spell regular and irregular verbs. *Reading and Writing: An Interdisciplinary Journal, 9*, 427–449.

Nunes, T., Bryant, P., & Bindman, M. (1997b). Morphological spelling strategies: Developmental stages and processes. *Developmental Psychology, 33*, 637–649.

Perfetti, C. (2007). Reading Ability: Lexical Quality to Comprehension. *Scientific Studies of Reading 11(4)*, 357-383.

Perfetti, C., Landi, N., & Oakhil, J. (2005). The Acquisition of Reading Comprehension Skill. In M. J. Snowling, & C. Hulme, *The Science of Reading: A Handbook* (pp. 227-247). Oxford: Blackwell.

Perfetti, C., Yang, C., & Schmalhofer, F. (2008). Comprehension Skill and Word-to-Text Integration Process. *Applied Cognitive Psychology, 22*, 303–318.

Pierce, J. (1960). *A Frequency Count of Turkish Words.* Ankara: Ministry of Education, Directorate of Publications, Printed Education Materials Development Center.

Ramirez, G., Chen, X., Geva, E., & Kiefer, H. (2010). Morphological Awareness in Spanish Speaking English language learners: within and cross-language effects on reading. *Reading Writing*, 337-358.

Rastle, K. (2007). Visual Word Recognition. In M.G.Gaskell, *The Oxford Handbook of Psycholinguistics* (pp. 71-87). Oxford: Oxford University Press.

Rastle, K., & Davis, M. H. (2003). Reading morphologically complex words: Some thoughts from masked priming. In S. Kinoshita, & S. J. Lupker, *Masked priming: The state of the art* (pp. 279-305). New York & Hove: Psychology Press.

Rastle, K., Davis, M. H., & New, B. (2004). The broth in my brother's brothel: Morpho-orthographic segmentation in visual word recognition. *Psychonomic Bulletin & Review*, 11 (6), 1090-1098.

Rastle, K., Davis, M., Marslen-Wilson, W., & Tyler, L. (2000). Morphological and semantic effects in visual word recognition: A time-course study. *Language and Cognitive Processes 15*, 507-537.

Rızaoğlu, F. (2016). *Second Language Processing of English Past Tense Morphology.* Unpublished PhD Dissertation, Boğaziçi University.

Samuels, S. (1997). The Method of Repeated Readings. *The Reading Teacher Vol.50, No.5*, 376-381.

Say, B., Zeyrek, D., Oflazer, K., & Özge, Ü. (2002). Development of a corpus and a treebank for present-day written Turkish. In K. İmer, & G. Doğan, *Current research in Turkish linguistics: Proceedings of the 11th International Conference on Turkish Linguistics* (pp. 183-192). Northern Cyprus: Eastern Mediterranean University.

Schmitt, N., & Meara, P. (1997). Researching vocabulary through a word knowledge frameork:Word association and verbal suffixes. *Studies in Second Language Acquisition 19*, 17-36.

Schneider, W., Eschman, A., & Anthony, Z. (2002). *E-Prime: Reference guide.* Pittsburgh: Psychology Software Tools, Inc.

Seidenberg, M. S., & Gonnerman, L. M. (2000). Explaining derivational morphology as the convergence of codes. *Trends in Conginitve Sciences Vol.4 No.9*, 353-361.

Silva, R., & Clahsen, H. (2008). Morphologically complex words in L1 and L2 processing: Evidence from masked priming experiments in English. *Bilingualism: Language and Cognition Volume 11 Issue 02*, 245-260.

Singson, M., Mahony, D., & Mann, V. (2000). The relation between reading ability and morphological skills: Evidence from derivational suffixes. *Reading and Writing: An Interdisciplinary Journal 12*, 219-252.

Taft, M. (1981). Prefix Stripping Revisited. *Journal of verbal Learning and Verbal Beahaviour 20*, 289-297.

Taft, M. (1988). A morphological decomposition model of lexical representation. *Linguistics 26*, 657-667.

Taft, M. (2001). Lexical Access, Cognitive Psychology of. In N. J. Smelser, & P. B. Baltes, *International Encyclopedia of the Social & Behavioral Sciences* (p. Sec.3.13 Art 100).

Taft, M. (2004). Morphological decomposition and the reverse base frequency effect. *The Quarterly Journal of Experimental Psychology 57 A (4)*, 745-765.

Taft, M., & Forster, K. (1975). Lexical storage and retrieval of prefixed words. *Journal of Verbal Learning Behavior 14*, 636-647.

Tekcan, A., & Göz, İ. (2005). *Türkçe Kelime Normları.* Istanbul: Boğaz İçi Üniversitesi.

Trofimovich, P., & McDonough, K. (2011). Using priming methods to study L2 learning and teaching. In P. Trofimovich, & K. McDonough, *Applying Priming. Methods to L2 Learning, Teaching and Research: Insights from Psycholinguistics* (pp. 1-17). Amsterdam: John Benjamins .

Ullman, M. (2004). Contributions of memory circuits to language: The declarative/procedural model. *Cognition*, 231-270.

Ullman, M. (2005). A cognitive neuroscience perspective onsecond language acquisition: The declarative/procedural model. In C. Sanz, *Mind and context in adult second* *language acquisition: Methods, theory and practice* (pp. 141-178). Washington DC: Georgetown University Press.

Underwood, P., Myskow, G., & Hattori, T. (2012). The effect of speed reading instruction on Japanese high school students' English reading comprehension. *Journal of International Education Research*, 27-39.

Uygun, S. (2016). *The Processing of Compounds in Adult Second Language Learners of English and Turkish.* Unpublished PhD Dissertation submitted to Yeditepe University.

Uygun, S., & Gürel, A. (2016). Processing morphology in L2 Turkish: The effects of morphological richness in the L1. In A. Gürel (Ed.), *Second Language Acquisition of Turkish* (pp. 249-277). Amsterdam: John Benjamins.

Wang, X. (2007). Bilingual Lexical Representation And Processing: Evidence from Masked Priming Studies. Unpublished PhD. Dissertation submitted to Arizona University.

Waring, R. (1997). Graded and extensive reading- Questions and answers. *The Language Teacher, 21 (5)*, 9-12.

Woodcock, R. (1987). *Woodcock Reading Mastery Tests—Revised.* Circle Pines, MN: American Guidance Services.

Woodcock, R. W. (1984). *Woodcock language proficiency battery.* Allen, TX: DLM.

Zhang, D., & Koda, K. (2008). Contributions of L1 reading sub-skills to L2 reading development in English as a foreing language among school-aged learners. *Indonesian Journal of English Language Teaching. Vol.4 Number 1.*

APPENDICES

APPENDIX A

Test Items and Their Frequencies in Turkish Experiment

Morphologically Related Primes	**Frequency**	**Target Words**	**Frequency**	**Unrelated Primes**	**Frequency**
ücretsiz ‘without fee’	20	ücret ‘price’	79	tahta ‘wood’	77
Kayıtsız ‘relentless’	20	kayıt ‘registration’	69	bayan ‘lady’	68
etkisiz ‘effectless’	32	etki ‘effect’	65	ömür ‘lifespan’	64
uykusuz ‘sleepless’	14	uyku ‘sleep’	61	ilçe ‘province’	62
huzursuz ‘uneasy’	17	huzur ‘peace’	60	biçim ‘style’	61
imkansız ‘impossible’	37	imkan ‘capability’	44	köprü ‘bridge’	44
şüphesiz ‘doubtless’	43	şüphe ‘doubt’	37	damla ‘drop’	37
çaresiz ‘helpless’	44	çare ‘remedy’	33	ışın ‘ray’	33
kusursuz ‘faultless’	30	kusur ‘fault’	14	vişne ‘sour cherry’	14
sınırlı ‘limited’	87	sınır ‘limit’	79	melek ‘angle’	77
dalgalı ‘wavy’	43	dalga ‘wave’	74	sefer ‘journey’	77
amaçlı ‘with an aim’	68	amaç ‘aim’	63	gıda ‘food’	64
alkollü ‘drunk’	47	alkol ‘alcohol’	56	evren ‘universe’	55
boyalı ‘painted’	34	boya ‘paint’	50	ekip ‘squad’	50
dengeli ‘balanced’	30	denge ‘equilibrium’	37	tarif ‘recipe’	37

gönüllü ‘voluntary’	39	gönül ‘heart’	37	ihbar ‘warning’	37
hüzünlü ‘sad’	29	hüzün ‘sadness’	24	temas ‘contact’	24
namuslu ‘honorable’	14	namus ‘decency’	15	köpük ‘foam’	15
Means	**36**		**49.83**		**49.77**

APPENDIX B

Fillers of Turkish Experiment

Priming Words	Target Words	Unrelated Primes
rahatça ‘comfortably’	rahat ‘comfortable’	filan ‘someone’
açıkça ‘clearly’	açık ‘clear’	acele ‘urgent’
kabaca ‘roughly’	kaba ‘rough’	usta ‘master’
acemice ‘unskillfully’	acemi ‘novice’	evvel ‘previous’
çapkınca ‘flirtatiously’	çapkın ‘flirtatious’	aptal ‘fool’
uygarca ‘in a civilized way’	uygar ‘civilized’	asabi ‘nervous’
zengince ‘in a rich manner’	zengin ‘rich’	kur ‘exchange rate’
delice ‘madly’	deli ‘mad’	rahat ‘relaxed’
usulca ‘slowly’	usul ‘slow’	açık ‘open’
esmerce ‘brunette like’	esmer ‘brunette’	kaba ‘rough’
haince ‘traitorous’	hain ‘traitor’	acemi ‘novice’
zalimce ‘tyrannous’	zalim ‘tyrant’	çapkın ‘flirtatious’
koşar ‘runs’	koş ‘run’	uygar ‘civilized’
kaçar ‘escapes’	kaç ‘escape’	koş ‘run’
dalar ‘dives’	dal ‘dive’	kaç ‘escape’
dinler ‘listens’	dinle ‘listen’	dal ‘dive’
kalır ‘stays’	kal ‘stay’	dinle ‘listen’

basar 'steps'	bas 'step'	kal 'stay'
düşer 'falls'	düş 'fall'	bas 'step on'
yapar 'does'	yap 'do'	taşı 'carry'
donar 'freezes'	don 'freeze'	otur 'sit down'
kalkar 'gets up'	kalk 'get up'	göç 'immigrate'
yatar 'lies down'	yat 'lie down'	gir 'enter'
keser 'cuts'	kes 'cut'	koru 'protect'
cevap 'answer'	zengin 'rich'	
otel 'hotel'	deli 'mad'	
test 'test'	usul 'slow'	
iflas 'bankrupt'	esmer 'brunette'	
odun 'wood'	hain 'traitor'	
sedef 'pearl'	zalim 'tyrant'	
ruh 'soul'	düş 'fall'	
kol 'arm'	yap 'do'	
dul 'widow'	don 'freeze'	
keçi 'goat'	kalk 'wake up'	
ten 'complexion'	yat 'lie'	
bay 'gentleman'	kes 'cut'	
güven 'trust'	filan 'someone'	

divan ‘couch’	acele ‘urgent’	
kuyu ‘well’	usta ‘master’	
koyun ‘sheep’	evvel ‘previous’	
vapur ‘ship’	aptal ‘fool’	
tımar ‘grooming’	asabi ‘nervous’	
cam ‘glass’	kur ‘set up’	
ilke ‘principle’	taşı ‘carry’	
bela ‘trouble’	otur ‘sit down’	
diz ‘knee’	göç ‘immigrate’	
küf ‘mould’	gir ‘enter’	
sopa ‘stick’	koru ‘protect’	

APPENDIX C

Items of Turkish Experiment Version 1

Item Number	Prime	Target	Label
1	kusursuz	KUSUR	W-SIZ-N-T1
2	uykusuz	UYKU	W-SIZ-N-T1
3	şüphesiz	ŞÜPHE	W-SIZ-N-T1
4	sınırlı	SINIR	W-LI-N-T1
5	alkollü	ALKOL	W-LI-N-T1
6	gönüllü	GÖNÜL	W-LI-N-T1
7	etki	ETKİ	W-IDPR-N-T1
8	imkan	İMKAN	W-IDPR-N-T1
9	ücret	ÜCRET	W-IDPR-N-T1
10	amaç	AMAÇ	W-IDPR-N-T1
11	denge	DENGE	W-IDPR-N-T1
12	namus	NAMUS	W-IDPR-N-T1
13	bayan	KAYIT	W-UNRP-N-T1
14	biçim	HUZUR	W-UNPR-N-T1
15	ışın	ÇARE	W-UNPR-N-T1
16	sefer	DALGA	W-UNPR-N-T1
17	ekip	BOYA	W-UNPR-N-T1
18	temas	HÜZÜN	W-UNPR-N-T1
19	rahatça	RAHAT	F-CA-A-T1
20	açıkça	AÇIK	F-CA-A-T1
21	kabaca	KABA	F-CA-A-T1
22	acemice	ACEMİ	F-CA-A-T1
23	çapkınca	ÇAPKIN	F-CA-A-T1
24	uygarca	UYGAR	F-CA-A-T1
25	koşar	KOŞ	F-AR-V-T1
26	kaçar	KAÇ	F-AR-V-T1
27	dalar	DAL	F-AR-V-T1
28	dinler	DİNLE	F-AR-V-T1
29	kalır	KAL	F-AR-V-T1
30	basar	BAS	F-AR-V-T1
31	filan	FİLAN	F-IDPR-A-T1
32	acele	ACELE	F-IDPR-A-T1
33	usta	USTA	F-IDPR-A-T1
34	evvel	EVVEL	F-IDPR-A-T1

35	aptal	APTAL	F-IDPR-A-T1
36	asabi	ASABİ	F-IDPR-A-T1
37	kur	KUR	F-IDPR-V-T1
38	taşı	TAŞI	F-IDPR-V-T1
39	otur	OTUR	F-IDPR-V-T1
40	göç	GÖÇ	F-IDPR-V-T1
41	gir	GİR	F-IDPR-V-T1
42	koru	KORU	F-IDPR-V-T1
43	cevap	ZENGİN	F-UNPR-A-T1
44	otel	DELİ	F-UNPR-A-T1
45	test	USUL	F-UNPR-A-T1
46	iflas	ESMER	F-UNPR-A-T1
47	odun	HAİN	F-UNPR-A-T1
48	sedef	ZALİM	F-UNPR-A-T1
49	ruh	DÜŞ	F-UNPR-V-T1
50	kol	YAP	F-UNPR-V-T1
51	dul	DON	F-UNPR-V-T1
52	keçi	KALK	F-UNPR-V-T1
53	ten	YAT	F-UNPR-V-T1
54	bay	KES	F-UNPR-V-T1
55	ecpetsiz	ECPET	NW-SIZ-T1
56	emgansız	EMGAN	NW-SIZ-T1
57	dasesiz	DASE	NW-SIZ-T1
58	yutosuz	YUTO	NW-SIZ-T
59	kidesiz	KİDE	NW-SIZ-T
60	hetelsiz	HETEL	NW-SIZ-T
61	mobunsuz	MOBUN	NW-SIZ-T
62	tubonsuz	TUBON	NW-SIZ-T
63	upulsuz	UPUL	NW-SIZ-T
64	ifissiz	İFİS	NW-SIZ-T
65	yimilsiz	YİMİL	NW-SIZ-T
66	ökeçli	ÖKEÇ	NW-LI-T1
67	yenfeli	YENFE	NW-LI-T1
68	galuslu	GALUS	NW-LI-T1
69	düyeli	DÜYE	NW-LI-T
70	gıkalı	GIKA	NW-LI-T
71	rımalı	RIMA	NW-LI-T
72	yavılı	YAVI	NW-LI-T
73	pükürlü	PÜKÜR	NW-LI-T
74	gontlu	GONT	NW-LI-T
75	reneli	RENE	NW-LI-T

76	ıdıllı	IDIL	NW-LI-T
77	famıt	FAMIT	NW-IDPR-T1
78	mulur	MULUR	NW-IDPR-T1
79	gumur	GUMUR	NW-IDPR-T1
80	halna	HALNA	NW-IDPR-T1
81	dofa	DOFA	NW-IDPR-T1
82	fücün	FÜCÜN	NW-IDPR-T1
83	fotuk	FOTUK	NW-IDPR-T
84	yuku	YUKU	NW-IDPR-T
85	tübis	TÜBİS	NW-IDPR-T
86	kütül	KÜTÜL	NW-IDPR-T
87	könfe	KÖNFE	NW-IDPR-T
88	ivzen	İLMOL	NW-UNPR-T1
89	ahdar	NÖMÜL	NW-UNPR-T1
90	yofuk	ŞIVIR	NW-UNPR-T1
91	ünür	İTYİ	NW-UNPR-T1
92	elpe	OYFU	NW-UNPR-T1
93	şamva	VÜPZE	NW-UNPR-T1
94	kerpi	SAVNA	NW-UNPR-T
95	sire	BOMU	NW-UNPR-T
96	bete	DUDA	NW-UNPR-T
97	öküt	PITA	NW-UNPR-T
98	yorak	TEPİL	NW-UNPR-T
99	yülterem	YÜLTE	NW-NS-T
100	yikerk	YİKE	NW-NS-T
101	samıroz	SAMI	NW-NS-T
102	pobunark	POBUN	NW-NS-T
103	uflumur	UFLUM	NW-NS-T
104	kovrutar	KOVRU	NW-NS-T
105	utrusork	UTRUS	NW-NS-T
106	ceferek	CEFER	NW-NS-T
107	sıtanaz	SITA	NW-NS-T
108	kafrıtar	KAFRI	NW-NS-T

APPENDIX D

Test Items and Their Frequencies in English Experiment

Morphologically Related Primes	**Frequency**	**Target Words**	**Frequency**	**Unrelated Primes**	**Frequency**
sleepless	1.35	SLEEP	81.44	train	79.56
brainless	0.88	BRAIN	77.02	scene	74.65
needless	2.27	NEED	66.76	film	65.25
spotless	1.18	SPOT	53.30	band	53.41
priceless	4.16	PRICE	48.72	teeth	47.84
countless	2.37	COUNT	31.26	noise	34.88
wireless	2.65	WIRE	24.68	duck	24.76
harmless	8.65	HARM	20.78	bowl	21.45
worthless	9.27	WORTH	19.56	trunk	19.80
painful	15.16	PAIN	97.94	club	98.00
peaceful	11.24	PEACE	69.61	favor	64.46
faithful	9.12	FAITH	46.33	cream	48.68
hopeful	2.98	HOPE	46.00	size	46.14
graceful	2.31	GRACE	42.29	sight	45.30
fearful	2.16	FEAR	42.00	milk	42.42
shameful	1.92	SHAME	41.57	nurse	40.42
colorful	3.20	COLOR	36.00	sugar	37.76

tasteful	1.35	TASTE	33.00	staff	32.00
Means	**4.56**		**48.79**		**48.71**

APPENDIX E

Fillers of English Experiment

Priming Words	**Target Words**	**Unrelated Primes**
Coldly	COLD	Poor
Smartly	SMART	Dirty
Thirdly	THIRD	Upset
Flatly	FLAT	Giant
Solidly	SOLID	Civil
Soberly	SOBER	Comic
Majorly	MAJOR	Seven
Darkly	DARK	Fool
Crossly	CROSS	Angry
Alertly	ALERT	Alien
Broadly	BROAD	Noble
Absurdly	ABSURD	Urgent
Weirdly	WEIRD	Quick
Chiefly	CHIEF	Angel
Pinkly	PINK	Wise
Thinly	THIN	Rare
Thickly	THICK	Brief
Blankly	BLANK	Novel
Grows	GROW	Admit
Costs	COST	Fill
Cooks	COOK	Vote
Washes	WASH	Pray
Serves	SERVE	Laugh
Scares	SCARE	Swim

Dares	DARE	Lock
Treats	TREAT	Visit
Allows	ALLOW	Agree
Draws	DRAW	Bite
Screws	SCREW	Focus
Spares	SPARE	Exist
Raises	RAISE	begin
Builds	BUILD	match
Feeds	FEED	claim
Shakes	SHAKE	bless
Paints	PAINT	cross
Enters	ENTER	alarm

APPENDIX F

Reading fluency scores of the participants*

Code of the Particants	Native Speakers	Pre-Intermediate Group	Upper-Intermediate Group
1	69	42	60
2	87	58	71
3	105	45	49
4	74	49	65
5	82	51	49
6	105	57	65
7	77	42	41
8	77	40	41
9	75	48	40
10	83	45	58
11	82	46	86
12	100	43	59
13	105	51	68
14	50	51	57
15	89	50	46
16	76	35	67
17	90	58	67
18	69	35	34
19	55	51	70
20	69	36	52
21	85	43	58
22	107	45	70
23	73	54	69
24		57	69

25		28	62
26		41	59
27		26	61
28		37	87
29		34	63
30		30	62
31		40	44
32		40	34
33		34	50
34		49	54
35		45	64

*These scores are raw scores based on 128 items.