THE USE OF SENSE-CONTINGENT SUBCATEGORIZATION BIAS INFORMATION BY Ll AND L2 ENGLISH SPEAKERS IN THE RESOLUTION OF TEMPORARY AMBIGUITY

Ph.D. Dissertation

Betül CANIDAR

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Ph.D. DISSERTATION

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JÜRİ VE ENSTİTÜ ONAYI

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ÖZET

İNGİLİZCE ANA DİLİ VE YABANCI DİL KONUŞURLARININ GEÇİCİ ANLAM BELİRSİZLİĞİNİ ÇÖZMEDE ANLAMA DAYALI ALTULAM BİLGİSİ KULLANIMI

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Eylemlerin anlamsal özellikleri, altulam seçimlerini etkileyen en temel unsurlardandır. İngilizce ana dili ve yabancı dil konuşurlarının anlama dayalı altulam seçimlerini incelemek amacıyla, iki tümce tamamlama testi ve bir gerçek zamanlı okuma deneyi yapılmıştır. Tümce tamamlama testleri, eylemlerin anlamsal özellikleri ile olasılığa dayalı altulam seçimleri arasındaki ilişkinin, yönlendirici bağlamların olduğu ve olmadığı durumlarda her iki grubun altulam seçimlerini etkilediğini göstermiştir. Bağlam tümceleri, her iki grupta da amaçlanan eylem anlamlarını ve ilişkili altulam seçimlerini etkinleştirmiştir. İngilizce ana dili konuşurlarının bu bağlamların varlığına daha duyarlı oldukları gözlemlenmiştir. Göz izleme deneyinde ise, dolaysız tümleç/yan tümce arasında geçici anlam belirsizliği içeren hedef tümceler kullanılmıştır. Sonuçlar, tümleyicinin olmadığı tümcelerde her iki grubun okuma sürelerinin arttığını göstermiştir. Bağlam bilgisinin ise okuyucuların tümceyi ilk çözümlemesinde önemli bir etkisinin olmadığı saptanmıştır. İngilizce ana dili ve yabancı dil konuşurlarının ilk olarak *en yakınındakine bağlama ilkesini* kullandıkları ve anlam belirsizliği taşıyan ad öbeğini hedef eylemin dolaysız tümleci olarak değerlendirdikleri gözlemlenmiştir. Bağlamın etkisi, önceki yanlış çözümlemelerin yeniden gözden geçirilme sürecinde önem kazanmıştır. Bağlam bilgisi, İngilizce yabancı dil konuşurları tarafından, ana dil konuşurlarına oranla görece daha erken kullanılmıştır. Sonuç olarak, iki grubun dil işlemleme örüntülerinin karşılaştırılması, İngilizcenin yabancı dil olarak işlemlenmesinin daha yavaş, daha zorlu ve otomatik olmayan bir süreç olduğunu göstermiştir.

Anahtar Sözcükler: Altulam yapısı, Dolaysız tümleç, Tümce işlemleme, Yan tümce, Yönlendirici bağlam

ABSTRACT

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Department of Foreign Language Education
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Verb sense is one of the most important factors that determine the subcategorization preferences of verbs. In order to find out whether L1 and L2 English speakers make sense-contingent subcategorization preferences, two sentence production tasks and a real-time reading experiment were conducted. The results of the off-line tasks including polysemous verbs demonstrated that the relationship between sense and subcategorization probabilities influenced L1 and L2 speakers' preferences both in the absence and presence of biasing contexts. These context sentences activated the intended verb senses and the associated subcategorization frames in both groups, with L1 English speakers being more responsive to their presence. Subsequently, in the eye-tracking experiment, target sentences including a temporary ambiguity between a direct object and a sentential complement were used. The results revealed that the reading times of both L1 and L2 speakers were elevated when the complementizer *that* was absent, and discourse context information did not have a significant effect on the construction of their initial analyses. The processing patterns of L1 and L2 speakers indicated that they initially used the *Minimal Attachment* heuristic and interpreted the ambiguous noun phrases as the direct objects of the target verbs. Only marginal effects of contexts were found while readers were revising their previous misanalyses. It was also observed that the influence of discourse context information was relatively earlier in L2 processing. As a result, a comparison of the processing patterns of the two groups indicated that L2 processing is slower, less automatic and more demanding.

Keywords: Biasing context, Direct object complement, Sentence processing, Sentential complement, Subcategorization

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Betül CANIDAR

March 2021

16/03/2021

STATEMENT OF COMPLIANCE WITH ETHICAL PRINCIPLES AND RULES

I hereby truthfully declare that this thesis is an original work prepared by me; that I have behaved in accordance with the scientific ethical principles and rules throughout the stages of preparation, data collection, analysis and presentation of my work; that I have cited the sources of all the data and information that could be obtained within the scope of this study, and included these sources in the references section; and that this study has been scanned for plagiarism with “scientific plagiarism detection program” used by Anadolu University, and that “it does not have any plagiarism” whatsoever. I also declare that, if a case contrary to my declaration is detected in my work at any time, I hereby express my consent to all the ethical and legal consequences that are involved.

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LIST OF ABBREVIATIONS

DO	: Direct object
FDH	: Fundamental Difference Hypothesis
GLMM	: Generalized linear mixed effects model
L1	: First Language
L2	: Second Language
SC	: Sentential complement
SF	: Subcategorization frame
SLA	: Second Language Acquisition
SSH	: Shallow Structure Hypothesis
UG	: Universal Grammar

1. INTRODUCTION

1.1. Background to the Study

> "The apparent everyday ease of language comprehension conceals considerable complexity in the processes that are necessary to its success." (Wilson and Garnsey, 2009, p. 368)

Human comprehension system is believed to rely heavily on information about verbs because the structural relationships among the individual words comprising a sentence are established, to a large extent, by the verb(s) in that particular sentence. Therefore, a good deal of valuable information required in the prediction of how a sentence unfolds is provided by verbs (Lee, Lu and Garnsey, 2013, p. 761). This claim brought with it the need for identifying the main components of knowing how a verb is used. As Hare, McRae and Elman (2003, p. 281) state, two of these components essential for comprehending and producing language are *thematic information* and *verb subcategorization information*. While thematic roles refer to the selectional semantic restrictions on the possible arguments of a verb, verb subcategorization refers to the information about the potential syntactic complements of verbs, which come from the lexicon. These specifications of verbs for the required upcoming syntactic structures are also known to vary in their numbers and types. The order and category of these permissible constituents that are likely to co-occur with verbs are named *subcategorization frames (SF)*. For example, intransitive verbs allow for only one argument - a subject- as in (1a), whereas transitive ones can take two (1b) or more (1c) arguments.

(1a) They laughed.

(1b) He read the book.

(1c) She bought me a drink.

As for the types of possible argument structures, noun phrases, prepositional phrases, adverbial phrases, sentential clauses, gerunds and infinitives are some of the typical constructions that can co-occur with verbs and, thus, are within the range of their possible SFs. To exemplify, the verb *admit* can subcategorize for noun phrases (2a), sentential complements (2b), gerunds (2c) and preposition + gerund constructions (2d).

(2a) He admitted all his mistakes.

(2b) He admitted that he had made mistakes.

(2c) He admitted making mistakes.

(2d) He admitted to making mistakes.

As has been observed in Examples (2a)-(2d), numbers and types of SFs differ. Another difference is the probability of co-occurrence of a verb with a particular complement. That is, even though the verb *admit* allows for direct objects, sentential complements, gerunds and preposition + gerund constructions, it appears with sentential complements more frequently compared to the other types of complements. Therefore, *admit* is labeled as a sentential-complement (SC) biased verb (Garnsey, Pearlmutter, Myers, Lotocky, 1997; Wilson and Garnsey, 2009). These preferential SFs of verbs are called *verb bias,* which is of vital importance, especially when verbs subcategorize for two or more complement types (Dussias and Cramer, 2006, p. 166).

Congruent views on the significance of learning verb argument structures in language production and comprehension have raised questions about the probable factors that might have led to the formation of frequency-sensitive verb biases. Although the complex relationship between sense and structure has been under careful scrutiny of theoretical linguists for decades (Grimshaw, 1979; Chomsky, 1981; Levin, 1993; Goldberg, 1995; Pesetsky, 1995; Argaman and Pearlmutter, 2002), it has come into prominence in the fields of psycholinguistics and second language acquisition (SLA) relatively recently. An extensive body of research into this relationship revealed that the meaning of a verb and the syntactic structures it co-occurs with place constraints on each other (Gillette, Gleitman, Gleitman, Lederer, 1999; Roland, 2001; Hare et al., 2003; 2004). More specifically, the probable relationship between verb sense and verb subcategorization probabilities was investigated by Roland (2001), who developed a model based on the ways in which this relationship contributes to the prediction of verb SFs. He suggested that, in some cases, there might be a remarkable interplay between the meaning of a verb and whether it is followed by a DO or an SC. To illustrate, two different senses of the polysemous verb *admit* are "to admit the truth of something" and "to allow someone to enter a public place". In cases where it denotes "to admit the truth of something", it is usually followed by SCs as can be seen in (3a). On the contrary, when it means "to allow someone to enter a place", a DO is more likely to follow as illustrated in (3b). Furthermore, an asymmetry is observed as the SC-sense of *admit* allows for a DO as in (3c), but not vice versa. All these imply that it is vital for readers or listeners to figure out this relationship for more efficient comprehension.

(3a) You must admit that Mary is good at her job.

(3b) The board of directors admitted John into the club last year.

(3c) Mark admitted his faults.

Taking into consideration the complexity of human language processing and the fascinating performance of humans in comprehending sentences, scholars from the field of psycholinguistics attempted to provide a satisfactory answer to the key question of how human parser works and integrates different information sources during sentence processing. A good deal of research suggests that language processing necessitates the exploitation of syntactic and semantic information as well as discourse and world knowledge (Clifton, 1993; MacDonald, Pearlmutter and Seidenberg, 1994; Tanenhaus and Trueswell, 1995; Jurafsky, 1996). Motivated by these findings and the claim that verbs place constraints on the other components in a sentence, several researchers set out to investigate the influence of verb subcategorization probabilities on how humans process language. As Dussias and Cramer-Scaltz (2008, p. 501) suggest, structural decisions made by the human parser are based, at least partially, on information about the specific properties of verbs. As a result, the difficulties or comprehension breakdowns encountered during this process have sparked great interest in psycholinguistic theories.

In search of an effective way to test the processing theories, the majority of researchers argue that materials involving ambiguity carry them through plausible explanations and help them shed more light on this inherently sophisticated parsing process. Roland, Elman and Ferreira (2006, p. 245) emphasize the fundamental place of ambiguity in language comprehension as follows:

> "From a certain perspective, linguistic expressions include massive lexical, structural, and acoustic ambiguity. Even when the ambiguities are ultimately resolved by subsequent information, the incremental nature of most language processing suggests that comprehenders must deal with even temporary ambiguities during the course of sentence comprehension. Yet we seem to understand linguistic expressions with comparative ease, scarcely even noticing any ambiguities at all."

As a result, sentences including temporary syntactic ambiguity have become the primary focus of sentence processing studies. A major line of research investigated how a particular syntactic analysis of a sentence is adopted by the human parser, and to that end, globally and locally ambiguous materials were constructed to be used in these studies. The main reason why ambiguous materials are favored in processing studies is that finding out how parsing decisions are made helps us gain a better insight into the processing mechanisms and the architecture of the human parser.

As one of the major concerns of the present study is the processing of locally ambiguous sentences, further explanations about them will be provided in the following sections. Traxler and Pickering (1996, p. 992) define *local ambiguity* as the compatibility of a sequence of words with more than one analysis at some point while the parser is processing a sentence, and it usually persists until the parser encounters additional information (Long and Prat, 2008, p. 376). The ambiguous materials usually include garden-path sentences which result in initial misinterpretations. Wilson and Garnsey (2009, p. 368) define *garden-paths* as sentences that "reveal the underlying complexity by leading to characteristic errors of interpretation". They also argue that these sentences which require reanalysis after initial misinterpretations usually take longer to comprehend. As Jacob and Felser (2016, p. 907) point out, garden-path sentences provide researchers with invaluable knowledge about how incoming new information is integrated into the continuously evolving interpretation of a sentence or into a previous analysis. Moreover, in cases where the initial analysis turns out to be incorrect, the use of garden-path sentences renders it possible to investigate how the conflict between the initial analysis and the correct one is resolved by the parser. As a result of numerous research studies and congruent views on the contribution of garden-path sentences to processing research, why and how readers are garden-pathed by only certain types of sentences has become a subject of critical scrutiny.

The type of structural ambiguity which leads to garden-pathing and thus is used in the present study is SC/DO ambiguity. Sentence (4) below is an example containing this specific type of ambiguity, and most readers are expected to be garden-pathed by it:

(4) He found the key had been hidden inside the car.

In sentence (4), which turned into an ambiguous one due to the omission of the optional complementizer *that*, readers are likely to initially interpret the phrase *the key* as the DO of the main verb *found*. As they proceed further in the sentence, they realize that it turns out to be the subject of the embedded clause. This means their initial interpretation of the temporarily ambiguous phrase is incorrect and they can come to realize it only when they reach the disambiguating region *had been hidden*. These errors are assumed to stem from the incremental nature of sentence processing. That is, readers try to interpret each incoming word as soon as they encounter it instead of waiting until they reach the disambiguating regions in these types of sentences.

The comprehension of these garden-path sentences and the resolution of ambiguity they contain have brought about an intense debate over the types of information the parser uses while making decisions. The exact time at which different information sources come into play and the probable interaction among them during sentence comprehension have also been investigated. As a result, mainly two broad categories of sentence processing accounts emerged over time and a great majority of the subsequent studies endeavored to test their claims.

According to modular, two-stage theories, the longest-established and most well-known of which is *the Garden-Path Model* (e.g. Frazier, 1978), the parser relies solely on simple processing strategies, or *heuristic*s, based on syntactic information in the construction of initial analyses. If the initial interpretation turns out to be incorrect, it is revised at the reanalysis stage, and it is only at this stage that the other information sources such as verb subcategorization information, discourse context information or world knowledge are employed. This account argues that readers can construct simple structures more quickly and easily, thereby making sentence interpretation faster and more efficient. On the other hand, constraint-based (interactive) models (e.g. MacDonald et al., 1994; Trueswell, Tanenhaus and Garnsey, 1994) take probabilistic and context-sensitive issues into consideration and posit that multiple sources of information concurrently constrain parsing decisions when at least two structures are permitted by the grammar (Trueswell, Tanenhaus and Kello, 1993; Pearlmutter and MacDonald, 1995; Spivey-Knowlton and Sedivy, 1995). As Wilson and Garnsey (2009, p. 369) point out, the accuracy of the multiple interpretations that evolve in parallel depends on the relative weights of the evidence in their favor. By exploiting all accessible information sources as early as possible, the most likely analysis is adopted by the parser. In some of these models (e.g. constraint-based lexicalist framework), detailed lexical information such as verb subcategorization and verb bias is claimed to be notably influential even at the earliest stages of parsing (MacDonald et al., 1994; Pearlmutter, Daugherty, MacDonald, Seidenberg, 1994; Trueswell and Tanenhaus, 1994; Trueswell et al., 1994). These two classes of models both have some things in common and hold divergent views on some aspects of sentence processing.

Following the controversial suggestions of the two mainstream processing accounts, there has been a considerable increase in our understanding of how readers or listeners process language in their L1s over the last couple of decades. However, little is known about how language learners make parsing decisions, what information sources they exploit and how they cope with the challenges that arise. On sober reflection, researchers have come to a mutual understanding of the vitality of integrating multiple information sources during parsing. Thus, possible reasons for the lack of native-like ultimate attainment of late L2 learners have emerged as a central question to be revisited. A good deal of research has been done on the similarities or differences between L1 and L2 speakers' processing patterns and whether the differences are quantitative or qualitative in nature.

To sum up, the need for a better understanding of the L2 processing mechanisms and the ways in which L2 speakers employ multiple information sources adds up to the lively debate over the nature of L1 processing, thereby stimulating further research to test the psycholinguistic theories of sentence processing in both L1 and L2.

1.2. Statement of the Problem

As a specific topic of interest, the controversy over whether the sentence structure or the verb is the key element in the comprehension of sentences dates back to the 1960s. Chomsky (1965), who introduced the idea of transformational generative grammar, put a premium on the leading role of verbs, whereas cognitive linguists like Goldberg (1995) suggested that constructions (i.e. form and function pairings) learned through exposure to the language have a more fundamental role in sentence comprehension. The research into this issue and the new ideas put forward has received considerable attention for decades.

As a subcomponent of this debate, readers' and listeners' tendency to immediately attach the incoming input into their evolving sentence representations have raised the question of how they make these immediate parsing decisions. The roles of verb subcategorization and discourse context information in parsing seem to have comprised a relatively large part of L1 sentence processing research (e.g. Trueswell et al., 1993; Roland, 2001; Hare et al., 2003, 2004; Wilson and Garnsey, 2009; Mohamed and Clifton, 2011).

In a similar vein, SLA researchers have brought attention to the difficulty of learning/acquiring these properties of verbs and employing this knowledge in comprehending sentences in an L2. It is only recently that the structure of the L2 parser, the kinds of information to which it has access and the similarities/differences between native and non-native parsing have become core issues in L2 sentence processing. The first view proposed is that L1 and L2 speakers differ significantly in the ways they process grammatical structures (Felser, Marinis and Clahsen, 2003; Papadopoulou and Clahsen, 2003; Marinis, Roberts, Felser, Clahsen, 2005), and these studies provided evidence for Clahsen and Felser's (2006b) claim that non-native speakers' computation of syntactic representations is shallower and less detailed. On the other hand, the findings of another group of researchers suggest no qualitative differences between L1 and L2 speakers' use of information sources in processing (White and Genesee, 1996; Williams, Möbius and Kim, 2001; Johnson, Fiorentino and Gabriele, 2016). It is argued that the processing mechanisms of adult L1 and L2 speakers, in essence, function in the same way, enabling L2 learners to come up with sentence representations with similar, deep hierarchical structures (Frenck-Mestre and Pynte, 1997; Juffs, 1998).

In brief, the present study was inspired by the complexity of the relationship between verb sense and syntactic subcategorization, the difficulties L2 learners experience in producing these sense-contingent verb SFs, the complexity of L1 and L2 processing procedures and the disputable failure of late L2 learners in reaching native-like, ultimate attainment in the target language.

1.3. Objectives of the Study

The current study aims to investigate L1 and L2 English speakers' use of sense-contingent subcategorization bias information not only in the production of sentences but also in the resolution of temporary syntactic ambiguities involved in sentences with polysemous verbs in English. This study was basically motivated by Roland (2001) and Hare et al.'s (2003) claim that verbs' subcategorization profiles are likely to vary by sense. Borrowing from both linguistics and psychology, the present research has two dimensions.

The first part of the study endeavors to find out the effects of the presence or absence of semantically biasing contexts on the activation of the intended verb senses and the SFs associated with these particular senses in the production of the language. In line with this purpose, two off-line sentence completion tasks were assigned to both a group of Turkish L2 learners of English and a group of English native speakers. In the second part of the study, the eye-tracking paradigm was used in order to tap into the participants' comprehension processes in real time and to examine the use of the two information sources (i.e. verb subcategorization and discourse context information) during online processing. Both production and comprehension data were collected because the participants' behavioral performances on off-line tests are considered to be rich sources of information about the representations which are, in fact, based on online processing (Ferreira and Yang, 2019).

Additionally, the biggest impetus for this research was the assumption that late L2 learners experience some difficulties in the comprehension and production of sentences containing verbs with different subcategorization patterns. The sense-contingent variation in these patterns are also thought to make the issue more complex for late L2 learners in a foreign language environment. Therefore, the current study aims to offer some implications that will illuminate the language learning/teaching process.

In the light of what has been mentioned so far and on the assumption that adopting some interdisciplinary methods raises more tangible and reliable results, the current research aims to investigate the intricate process of L1 and L2 speakers' use of grammatical and non-grammatical information sources in the process of sentence production and comprehension. It also attempts to compare the syntactic ambiguity resolution strategies of adult native speakers and proficient L2 learners of English. The findings are expected to provide evidence for the predictions of either two-stage or constraint-based sentence processing accounts. Finally, lack of adequate evidence supporting or contradicting the arguments of the Shallow Structure Hypothesis (Clahsen and Felser, 2006b), one of the few accounts of L2 sentence processing, creates a need for further experimental studies in L2 contexts. Therefore, filling this niche in the literature and broadening the scope of inquiry have added a fresh impetus to the present study.

1.4. Research Questions

In the light of the previous studies discussed above, the following research questions were constructed to guide this study:

1. Do L1 and L2 speakers use the multiple senses of English polysemous verbs and the different subcategorization frames (SF) contingent on verb senses in the absence of semantically biasing contexts on an off-line sentence completion task?
2. Is L1 and L2 speakers' use of these polysemous verbs and the different SFs promoted by semantically biasing contexts on an off-line sentence completion task?

3. Do L1 and L2 English speakers make use of discourse context information and their knowledge of verbs' sense-contingent subcategorization probabilities during real-time sentence processing?

The first question aims to find out whether L1 and L2 speakers can use sense-contingent verb bias information in the production of sentences out of context. This question is also expected to provide information about whether L1 and L2 speakers of English differ in their sensitivity to verb bias information. Based on previous research (Johnson and Newport, 1989; DeKeyser, 2000; Prévost and White, 2000; Papadopoulou and Clahsen, 2003), it is predicted that L2 speakers will be more likely to fall behind L1 speakers on the off-line sentence completion task due to several factors such as L1 characteristics, exposure to L2 or developmental factors that prevent them from reaching native-like ultimate attainment in L2.

The second question is concerned with the facilitating effect of biasing context information in the retrieval of sense-contingent SFs of a set of English polysemous verbs. In other words, it attempts to find whether biasing contexts promote the target senses of verbs and the related SFs. It also aims to explore the extent to which L1 and L2 speakers are sensitive to this knowledge while producing language. Based on the suggestions of the context-sensitive model (Paul, Kellas, Martin, Clark, 1992; Vu, Kellas and Paul, 1998), it is anticipated that the SC-biasing and DO-biasing contexts constructed for this study will activate the intended senses in the target sentences, which will subsequently contribute to the retrieval of appropriate SFs.

The final research question is intended to shed more light on the exploitation of the two information sources (i.e. verb subcategorization and discourse context) by L1 and L2 speakers during online processing. The primary goal of this question is to provide answers to the sub-questions regarding the use of non-syntactic information sources. To be more precise, it is expected that the differences in reading times for sentences preceded by SC-biasing and DO-biasing contexts will reveal the role of discourse context information in parsing. The answer to this question will reveal whether the two information sources, the main variables of concern in this study, lead to an early or late influence on readers' parsing decisions. Also, the probable differences in L1 and L2 speakers' parsing strategies will be detected.

1.5. Significance of the Study

As has been previously pointed out, there is a growing body of literature on the issue of human sentence processing attracting the attention of researchers from various fields. The findings of many previous studies were based on either the production of the target structure in off-line tasks or the comprehension of these structures in online tasks. However, a clear understanding of sentence processing can best be gained by placing equal importance on both aspects of language production and comprehension. In this respect, the present study differs from some of the previous research studies because the data were gathered through both off-line sentence completion tasks and a real-time reading task. That is to say, language production and comprehension data were assumed to complement each other, making it possible to get the complete picture of how people interpret and produce language.

There are only a handful of studies in the literature that put specific emphasis on the role of verb semantics in the formation of verb bias patterns (Roland, 2001; Hare et al., 2003; Uçkun, 2012). With these limited number of research studies, the present study is expected to further our understanding of the semantic aspect of verb subcategorization formation based on the empirical evidence for the interaction between verb sense and subcategorization (Green, 1974; Pinker, 1989; Roland, 2001; Hare et al., 2003). Of the three studies dealing directly with sense-contingent verb SFs, the one designed by Roland (2001) was a corpus-based study and Hare et al.'s (2003) study was conducted in an L1 context. Motivated by Hare et al.'s research, the present study focuses on almost the same points except that it was carried out in an L2 context with a group of Turkish students who were late L2 learners of English. Another difference between these two studies lay in the techniques used. While Hare et al. (2003) conducted a self-paced reading experiment, the eye-tracking technique was adopted in the present study basically for the reasons that will be explained in section 2.7. As for Uçkun's (2012) research into foreign language learners' awareness of verb subcategorization probabilities, it is, to the researcher's knowledge, the only study on sense-contingent verb bias carried out in Turkish context. However, the main concerns of her study were to identify whether L2 learners can make sense-contingent subcategorization distinctions and to examine the effects of L1 and learners' English proficiency levels. Therefore, only language production data were collected and analyzed in her study. As mentioned above, one of the main goals of the present research is to investigate the comprehension processes of L2 learners, as well.

As has been previously discussed, there is an ongoing debate on whether the claims of two-stage modular theories or constraint-based models explain sentence processing better. This study is expected to provide evidence in favor of one of these models, contributing to the discussion regarding L1 processing.

As another construct of interest, there is no consensus on the exact time when discourse context information comes into play during parsing (Altmann and Steedman, 1988; Ferreira and Clifton, 1986; Britt, Perfetti, Garrod, Rayner, 1992; Mitchell, Corley and Garnham, 1992; Spivey and Tanenhaus, 1998; Hare et al., 2003). In the same line with these studies, the present research aims to provide a plausible answer to this question. Another point which makes its methodology stronger is that this study makes an attempt to rule out the criticism that researchers fail to provide the conditions of natural sentence comprehension by using isolated sentences in experiments (Demberg and Keller, 2008, p. 194). In this sense, biasing contexts constructed for this study are expected to enable participants to read and process sentences under conditions closest to natural language comprehension.

Considering the relatively limited but growing body of literature dealing with L2 parsing, this research also endeavors to address several questions related to both L1 and L2 parsing based on the data collected from both L1 and L2 speakers of English. In this way, it aims to reveal the similarities and differences between the processing patterns of these two groups.

In brief, it is possible to say that the most important contribution of the current research to the existing L1 and L2 sentence processing literature is that, to the best of researcher's knowledge, it includes one of the few, if any, eye-tracking studies examining the use of sense-contingent verb subcategorization bias and discourse context information in L1 and L2 processing of sentences including SC/DO ambiguity.

Finally, the findings might raise awareness about the factors influential on the learning of verbal complementation which is considered to be a challenging issue for those teaching/learning English as an L2.

1.6. Definitions of the Key Terms

Verb Subcategorization: It refers to a verb's "specification for required and obligatory upcoming syntactic structures" (Roland, 2001, p. 2).

Subcategorization Frame (SF): It denotes "the order and category of constituents that co-occur with a verb" (Dietrich and Balukas, 2012, p. 259).

Verb Bias: In cases where a particular verb can appear in various sentence structures, the one with which the verb co-occurs most frequently determines the bias of this verb. To illustrate, although the verb *read* can be followed by several syntactic structures such as DOs, SCs or prepositional phrases, it is more likely to be followed by a DO compared to others, making it a DO-biased verb (Garnsey et al., 1997, p. 60).

Verb Sense: It is used to refer to different but highly related meanings of a polysemous word (Hare et al., 2003, p. 283). The adoption of this new term resulted from the need to distinguish these closely related meanings of polysemous words from the distinct meanings of homonyms (Klein and Murphy, 2001, p. 260).

Parsing: It refers to the process in which the words and phrases comprising a sentence are divided into small components, analyzed, and inferences about its syntactic and semantic properties are made by readers. Clahsen and Felser (2006c, p. 564) use the term *grammatical processing* and define it as "the construction of structural representations for sentences, phrases and morphologically complex words in real-time language comprehension and production".

Syntactic (Structural) Ambiguity: It is used to describe situations in which ambiguous sentence structure leads to more than one possible interpretation of a sentence.

Garden-path sentence: It refers to a grammatically correct sentence which initially results in misinterpretation and then requires reinterpretation (Wilson and Garnsey, 2009, p. 368). While reading these sentences, the comprehenders are observed to either come to a dead end or come up with an unintended meaning, which makes reanalysis essential.

Eye Movements: Considered to be an invaluable source of information about human language processing, eye movements involve both the series of jumps (i.e. saccades) eyes make along the line while reading and the periods between saccades during which eyes are focused and relatively stable (i.e. fixations) (Rayner, Pollatsek, Ashby, Clifton, 2012, p. 6). Eye tracking technology measures these movements to display what people do and do not look at, exactly where their eyes are fixated, where their pupils move next and how long they look at a particular word, sentence, etc.

Area of Interest (Region of Interest): It is a sub-region of the stimulus displayed on the screen. An AOI can be a single word, a sentence or a paragraph depending on the aim of the research. It allows for the display of separate metrics for each region selected. That is to say, an area of interest can provide information about first fixation times, the total time spent, the number of fixations on a particular region and the number of revisits.

1.7. Outline of the Study

The present study is comprised of seven chapters. Chapter 1 introduces and exemplifies some key concepts dealt with in the present study. Also, theoretical background information, statement of the problem, objectives of the study and research questions are covered in this part. These sections are followed by the significance of the study and the definitions of some key terms.

Chapter 2 presents a theoretical and experimental review of the literature. It starts with some explanations and examples regarding verb subcategorization and its relationship with verb sense. Following the previous research on verb sense and subcategorization, the chapter provides an overview of the discussion about the two main approaches to sentence processing (serial vs. parallel accounts) and related studies so that a theoretical basis will be formed for the study. This chapter also includes some information about the role of discourse context information in sentence processing, L2 processing accounts, previous verb bias studies in L2 contexts and eye-tracking as a data collection technique in psycholinguistic research.

Chapter 3 aims to shed light on the general methodological framework and design of the study. Information about the research design, the selection of the target verbs as well as the participants, the data collection tool and procedures followed in the pilot study is provided. Moreover, the data analysis procedures and the results of the pilot study are presented in this chapter. These are followed by the procedures and the findings of the small-scale corpus testing. The subsequent sections of the chapter describe the participants, the data collection instruments and procedures, and the data analysis procedures that are gone through in Experiments 1, 2 and 3.

In Chapter 4, the findings of the three main experiments are displayed, and the presentation of the findings of each experiment is followed by a section in which these findings and the possible factors contributing to them are discussed in some detail.

The final chapter, Chapter 5, begins with a summary of the methodology and the results of the study. Following the conclusions drawn from the current study, the chapter includes implications for ESL/EFL teaching, the limitations of the study and suggestions for further studies. Finally, references and appendices are provided at the end of the dissertation.

2. LITERATURE REVIEW

2.1. Introduction

Language comprehension is inherently complex due to the following factors: availability of numerous information sources that guide sentence interpretation, the need for the integration of all these multiple sources, the rapid formation of hypotheses about the correct interpretation of a sentence (Trueswell and Gleitmann, 2007) and the need for handling the demands of the processing mechanism. This complexity and the possible existence of an intriguing mechanism coping with all these demanding tasks have made *human sentence processing* a center of interest in the field of psycholinguistics.

It has also been viewed as an issue worth investigating in SLA. It is frequently argued that the psycholinguistic processes and mechanisms underlying L2 sentence interpretation could be one of the leading factors that prevent L2 learners from reaching native-like ultimate attainment in the second language (Hopp, 2006, p. 369). The fact that L2 learners already have fully developed L1 skills makes this issue more complex and open to debate since this inevitably poses the question of whether L1 properties are activated in L2 sentence processing (Hopp, 2017). Nonetheless, the focus on L2 sentence processing is relatively recent; therefore, more research into the issue is essential for a better understanding of the underlying processes and factors facilitating or obstructing native-like parsing.

Based on the commonly-held belief that determining the syntactic relations among the constituents of a sentence is an essential requisite for understanding it (Adams, Clifton and Mitchell, 1998, p. 265), verbs are described as "an important source of expectancy generation in sentence comprehension" (McRae, Hare, Elman, Ferretti, 2005, p. 1174). They convey a good deal of syntactic and semantic information, and thus they are an indispensable part of the construction of the meaning and structure of a particular sentence (Trueswell et al., 1993, p. 528). This requires a complete mastery of some fundamental features of verbs, two of which are argument structures and verb bias.

It has long been well-established that specific attributes of verbs lie at the root of structural decisions, substantially affecting parsing (Ford, Bresnan and Kaplan, 1982; Mitchell and Holmes, 1985, Wilson and Garnsey, 2001). In other words, a wealth of empirical findings suggest that semantic and syntactic properties of verbs such as argument structures determine some aspects of sentence processing (Shapiro, Zurif and

Grimshaw, 1987; Collina, Marangolo and Tabossi, 2001; van Valin, 2001) by putting some constraints on the upcoming structures (MacDonald et al., 1994; Trueswell, 1996). To illustrate, Trueswell et al. (1993) point out that subcategorization properties of verbs are one type of specific verbal information that is immediately accessed by readers/listeners during processing. There is also ample evidence indicating that reading times and processing difficulty are influenced by the availability and accessibility of this information source (Trueswell et al., 1993; MacDonald, 1994; Trueswell and Kim, 1998; Hare et al., 2003; Wilson and Garnsey, 2009).

In general terms, Chapter 2 provides information about the theoretical background and related research into the issues the present study is based on. In the first place, the constructs of concern for this study, i.e. verb subcategorization and verb bias, will be explained, and the relationship between verb sense and subcategorization will be presented. These sections will be followed by a review of the related studies. Subsequently, theoretical approaches to human sentence processing and the role of subcategorization information in two mainstream theories will be explained. An overview of the related studies on L1 sentence processing follows these sections. Next, some theoretical approaches to L2 sentence processing and previous studies on verb bias information in L2 contexts will be presented. The next part of this chapter will be devoted to the role of discourse context information in processing and related research. Finally, eye-tracking as a psycholinguistic technique will be introduced and the definitions of the reading time measures used in the present study will be provided.

2.2. Definition of Verb Subcategorization and Verb Bias

Native speakers have an implicit knowledge of what type(s) of complements and subjects a particular verb requires to form a sentence, which is known as *argument structure.* This implicit knowledge is part of the competence and it is necessary for sentence comprehension. There is some evidence that suggests verbs which have the same argument structures occur in similar syntactic frames and thus place constraints on the ensuing sentence constructions (MacDonald et al., 1994; Trueswell, 1996).

Trueswell and Kim (1998, p. 103) define *lexical argument structures* as "information specifying how a word may combine syntactically and semantically with other words or phrases". More specifically, *verb argument structure* provides us with information about the possible words that can complement a verb (subcategorization information), the possible semantic or conceptual roles the verb denotes in a particular event (called thematic role information) and the match-up between these two information sources (Trueswell and Kim, 1998, p. 103).

As one of the dimensions of verb argument structure, *subcategorization* refers to what a particular verb needs or wants as the set of obligatory phrases and/or clauses it combines with (Chomsky, 1965). In line with Chomsky's suggestions, a team of researchers have agreed that these syntactic phrases/clauses which can complement a verb are represented in the lexical entry (Chomsky 1965; Grimshaw 1979; Collina et al., 2001; Shetreet, Palti, Friedmann, Hadar, 2007). It is proposed that individual verbs are associated with preferred subcategorizations which depend on how frequently comprehenders experience a particular co-occurrence (MacDonald et al., 1994; Jurafsky, 1996; Narayanan and Jurafsky, 1998). From this point of view, the *Linguistic Tuning Hypothesis* (Mitchell, 1989; Mitchell, Cuetos, Corley, Brysbaert, 1995) posits that when a verb is encountered with a particular subcategorization, comprehenders tend to anticipate that same subcategorization on their subsequent encounters with that verb. Therefore, parsing difficulty experienced by a reader is determined by his/her prior exposure to the given structure (Frenck-Mestre, 2005b, p. 272).

Another related term *subcategorization frame* (SF) is defined as "the order and category of constituents that co-occur with a verb". Dietrich and Balukas (2012, p. 259) explain it by elaborating on the SFs in which the verb *believe* can occur.

(1a) John believes the story.

(1b) John believes (that) the story was true.

(1c) John believes in Mary.

As illustrated in examples (1a)-(1c), *believe* can be complemented by a noun phrase (1a), a sentential complement (1b) and a prepositional phrase (1c). A verb's subcategorization determines syntactically what types of phrases can follow it (Carnie, 2002; van Valin, 2001). Both the type and number of these subcategorization options permitted by a particular verb vary.

Finally, the subcategorization frequency, which is also called *verb bias*, refers to the SF a particular verb prefers, and it is believed to play a pivotal role especially when more than one complement type is permissible (Dussias and Cramer, 2006, p. 166). For example, the verb *believe* can be complemented by noun phrases, sentential complements and prepositional phrases. However, the likelihood of encountering "believe + finite clause" constructions is greater compared to "believe + prepositional clause" or "believe + noun phrase" constructions. Therefore, *believe* is claimed to have an SC bias (Garnsey et al., 1997). As a matter of fact, this idea of verb subcategorization bias dates back to Fodor's (1978) prediction that a verb's transitivity preference could have an influence on whether or not gaps are hypothesized by the parser following this particular verb. In line with this prediction, Ford et al. (1982) held that each verb may be complemented with different SFs of varying strengths that depend on frequency and contextual factors. They also contended that the expectations determined by these SF strengths have a remarkable effect (Bod, Hay and Jannedy, 2003, p. 54).

In brief, the upcoming syntactic structures allowed or required by a verb, the attributes of these complements and the likelihood of co-occurrence of verbs with particular complement types have hitherto been broadly investigated. The main motivation of all this previous research was to establish new understandings of verbs' behaviors in different syntactic structures.

2.3. The Relationship between Verb Sense and Subcategorization

From the syntactic point of view, verb bias is formed as a result of the probabilistic verb and argument structure co-occurrences. When the semantic attributes of individual verbs are taken into consideration, a close link between verb sense and subcategorization becomes evident. Even though these semantic properties alone are not sufficient to fully account for the formation of structural choices, this relationship has been found to contribute greatly to the explanation of how verb bias is formed (Grimshaw, 1979; Levin, 1993; Pickering, Traxler and Crocker, 2000; Hare et al., 2003; 2004).

Even though it was argued that the lexical representations of verbs determine their possible subcategorization preferences (Pesetsky, 1995; Jurafsky, 1996), due consideration was not given to the factors that might have influenced the development of these probabilities. This led a group of researchers to find out more about this issue (Green, 1974; Grimshaw, 1979; Levin, 1993; Pesetsky, 1995; Roland, 2001). For example, Green (1974) examined the relationship between different senses of the verb *run* and its SFs. She maintained that *run* explicitly expresses locomotion when it is used intransitively as illustrated in examples (2) and (3) (taken from Roland, 2001, p. 28).

(2) John ran fast.

(3) John ran into the room.

On the other hand, if *run* is followed by the preposition *for* and a noun which refers to an elective office as in example (4), it involves a goal-oriented activity but not locomotion (taken from Roland, 2001, p. 29).

(4) Lenore ran for senator.

Green's (1974) final argument was that verb sense plays a determinant role in the syntactic properties of argument structures on the grounds that it is possible to substitute other locomotion verbs in examples (2) and (3), but not in (4).

Pinker (1989) is another leading researcher who proposes that the type of the syntactic structure in which an individual verb occurs is uniquely specified by subtle semantic distinctions. He analyzed the different uses and senses of the verb *spray*. He maintained that in example (5a) below, the wall is considered to be fully painted, whereas in example (5b) the message conveyed is that there is paint on a small part of the wall (Pinker, 1989, p. 228). He thus claims that in these two examples, the verb *spray* is used with its two different senses: "to completely cover" in (5a) and "to splash" in (5b).

(5a) Bob sprayed the wall with paint.

(5b) Bob sprayed paint onto the wall.

These claims sparked more research into the issue. Although the details of the subsequent studies will be provided in the following section, a consensus on the existence of the syntax-semantics relationship seems to have been built.

2.3.1. Previous studies on verb sense and subcategorization

In order to have a broader base of knowledge about the nature and strength of the link between verb semantics and syntax, starting in the early 1990s, several scholars attempted to prove that using syntactic structure as a cue facilitates the determination of verb meaning. First, Fisher, Gleitman and Gleitman (1991) focused on the semantic content of SFs and carried out a series of experiments. A comparison of the findings of semantic-relatedness and grammaticality judgment tasks demonstrated that verb semantics is a major determinant of verb syntax. Following this study, Gillette et al. (1999) conducted an experiment that drew its data from a sample of maternal speech to young children. They set out to investigate the type of information that has a facilitative role in the identification of a group of selected nouns and verbs. The results of the study revealed that children's knowledge of possible syntactic frames in which a given verb appears enables them to deduce the verb's meaning easily. They thus obtained results confirming the relationship between verb sense and SFs, albeit indirectly.

Based on these findings, the limited number of studies on verb subcategorization probabilities were criticized for taking only the verb word forms into consideration and ignoring the individual senses of verbs (Trueswell et al., 1993; Merlo, 1994; Garnsey et al., 1997).

In an attempt to fill this gap in the literature, Roland (2001) suggested that verbs with different senses, i.e. polysemous verbs, and SFs should be studied. To illustrate, *grasp* has a concrete and an abstract sense. It means "to grip" in its concrete sense as in (6a), while it means "to come to understand" in its abstract sense (6b). In each sense, the subcategorization preference of the verb seems to change (taken from Hare et al., 2003, p. 283).

(6a) She grasped the handrail.

(6b) She grasped that he wanted her to be quiet.

This claim and the obvious differences in verb subcategorization probabilities between different corpora and experimental studies led Roland (2001) to investigate the possible root causes of these dissimilarities. He discovered that different senses, their corresponding SFs and different data collection procedures could be responsible for the inconsistencies between the results of norming studies and corpus-based research. He thus reached the conclusion that specific verb senses are of crucial importance in specifying verb bias patterns.

In another study, Roland and Jurafsky (2002) aimed to corroborate this view and compared the subcategorization probabilities of three polysemous verbs. They mainly dealt with the semantic biases of these verbs. Analyzing sentences from three different corpora, they found that systematic differences in the subcategorization frequencies of their target verbs were related to their senses. As a result, they emphasized the need for some changes in the view favoring overall structural verb bias over other causal factors.

Moreover, Argaman and Pearlmutter (2002) predicted that semantics have some control over the variation in argument structure biases, so they examined a set of SC-taking verbs. Data gathered for the target verbs (e.g. propose) and their corresponding nouns (e.g., proposal) from sentence completion surveys and various corpora revealed that these verb-noun pairs in their SC-taking bias significantly correlated. They concluded that differences in SC-biases cannot be explained exclusively on the basis of morphological properties of verbs. Instead, their lexical-semantic properties should also be taken into account.

As a result, more attention was paid to *polysemous verbs* in the studies conducted thereafter. Rice (1992, p. 89) states "polysemy assumes that the multiple meanings constitute a family of related senses and is, therefore, distinguished from homonymy, in which different meanings are not presumed to have any apparent connection". Thus, she defines these verbs as the ones having closely related meanings with a concrete physical sense and an abstract/metaphorical sense. These different but closely related meanings of polysemous verbs are named *verb senses* so that they can be easily distinguished from the totally distinct meanings of homonyms (Klein and Murphy, 2001, p. 259).

Basing their arguments on the sense-structure relationship and focusing on verb bias as one aspect of this complicated link, researchers carried out corpora analyses (Hare et al., 2003, 2004), self-paced reading time studies in L1 (Hare et al., 2003) and production tasks in L2 contexts (Uçkun, 2012). The results of these limited number of studies are rather consistent but they demonstrate the need for more investigation in order to pursue this claim further.

Hare et al. (2003) performed one of the first studies looking into the structural biases of some polysemous verbs. Based upon Roland (2001), Roland and Jurafsky (2002) and Roland, Jurafsky, Menn, Gahl, Elder, and Riddoch's (2000) findings, Hare and her colleagues investigated whether a semantic context preceding the verb can influence the likelihood of the retrieval of intended verb senses and their associated subcategorization probabilities. This, in turn, is expected to affect comprehenders' parsing decisions. The results of their corpora analyses and off-line sentence completion tasks lent support to the existence of the relationship in question.

In order to substantiate their previous findings regarding the sense-structure correlations, Hare et al. (2004, p. 181) did another corpus analysis to find a larger number of verbs' overall and sense-contingent verb biases. They observed that both the formation of probabilistic verb bias and the use of this information by comprehenders are substantially dependent on the meanings of verbs rather than on a superordinate lexical entry.

In a more recent study, Uçkun (2012) tested the interaction between argument structure and verb semantics at the production level by carrying out two off-line experiments including L2 English learners as participants. Although she investigated the role of developmental factors and L1 effects, the overall results revealed that L2 speakers were good at making sense-contingent verb subcategorization distinctions when they were biased towards specific senses of polysemous verbs.

In spite of ample evidence pointing to the use of this sense-contingent verb bias information in language production, whether or not it has a real influence on the comprehenders' performance is still open to debate. As only a limited number of studies were centered upon the question of whether readers' knowledge of this relationship is effective while interpreting sentences, this has recently become an intriguing research issue in sentence processing.

2.4. Human Sentence Processing

The language comprehension system in humans is considered to be amazing due to its ability to integrate multiple relevant information sources during sentence interpretation (Marslen-Wilson, 1975). Both comprehension and generation of language are amazingly speedy and accurate in humans. People are also required to cope with distractions such as noise and ambiguity as well as adjusting themselves to new speakers, domains and registers. On top of it, they perform without receiving any training or supervision (Hart and Risley, 1995).

In an attempt to clarify the processes underlying this complex cognitive activity, psycholinguists viewed *sentence processing* as a subfield and dealt with how people interpret sentences. In this process, they are assumed to make use of a good deal of information such as lexical information (e.g. word meanings, argument structures, number, animacy, thematic roles), syntactic information (e.g. structure building operations), discourse information (e.g. discourse markers, conventions, paralinguistic features), prosody (e.g. pitch, durational information), visual context, and so forth.

The most prominent and agreed-upon characteristic of this demanding process is *incrementality*. The incremental nature of processing requires "the rapid integration of incoming words with stored knowledge" (Garnsey et al., 1997, p. 58). Also, readers or listeners are assumed to make commitments to the continually evolving interpretation of a sentence upon encountering the linguistic input (Crain and Steedman, 1985; Altmann and Steedman, 1988). Almost all sentence processing models two of which will be explained below agree that people build up interpretations in a word-by-word manner.

As Ferreira and McClure (1997, p. 273) suggest, so as to make a syntactic commitment to a sentence, two main requirements should be met: access to grammar that is essentially comprised of the general syntactic principles and constraints in a language, and a parser that is the mechanism applying the grammatical knowledge to incoming stimuli online. During the comprehension process, the parser is responsible for making decisions on how to integrate each new word into the current structure.

The importance of the role assigned to the *parser*, also called *the syntactic processor,* has raised some questions about its architecture. Some of the issues that need to be clarified are the type of knowledge employed by the parser, the ways in which this knowledge is represented and the interaction between the parser and some cognitive factors like working memory, reading speed and perception span. They each have become major issues that generate particular interest in the field.

Before going into the details of studies that provide answers to these questions, it is worth noting that Keller (2010, p. 60) listed the key properties of the human processor. First, he defined it as "efficient and robust" because it has to deal with a wide variety of syntactic constructions and reaches the correct interpretation rapidly. Second, it supports word-by-word incrementality and constructs only fully connected trees. Next, it makes predictions about the upcoming words, phrases or structures. This predictive power enables it to make informed guesses about the upcoming stimuli using the cues encountered. Finally, due to memory limitations, the structures kept in memory are prone to decay and interference.

Another unexplored territory in sentence processing is the way in which the parser functions. Some attributes of it are disclosed more easily in the presence of multiple possibilities while processing a particular word/structure. As a result, ambiguity resolution emerged as a fruitful domain in which the functioning of human parser could be analyzed more closely. In parallel with Frazier (1987) and MacDonald et al.'s (1994) view that ambiguity is common in human language, Traxler and Pickering (1996) state that it is possible for a parser to encounter both globally ambiguous sentences where the entire sentence allows for two different interpretations and locally ambiguous ones in which there is only one point rendering more than one analysis possible.

A large number of psycholinguists examined the process while people are reading certain types of sentences that are known to result in typical interpretation errors called *garden paths*. As Wilson and Garnsey (2009) state, garden-pathing can usually be observed when a reader initially misinterprets a sentence and so needs to reinterpret it. These misinterpretations result from readers' hesitations about how to integrate the new word into the unfolding sentence in the presence of an ambiguity. Therefore, it usually takes longer to understand these garden-path sentences compared to unambiguous ones (Wilson and Garnsey, 2009, p. 368). As a result, questions about how the parser decides which of the possible analyses to select, when it makes this decision or what information sources contribute to this selection process have become matters of debate. A variety of explanations about these open questions led to the emergence of two competing and compatible sentence processing accounts.

2.4.1. Theoretical approaches to human sentence processing

Although there has been a great deal of convergence on the possibility of grammatically permissible alternatives and on the idea that the parser has to make a choice between them, sentence processing models diverged in the criteria guiding this selection. As a result, mainly two different classes of processing theories have been developed. One of the features that distinguish these models from one another is the role of the lexically encoded information at initial stages of syntactic parsing (Dussias et al., 2010, p. 1005).

2.4.1.1. *Modular two-stage approaches*

The first group of sentence processing theories are named *modular two-stage theories*, *serial accounts, syntax-first models* or *restricted accounts of parsing* in the literature. These accounts rest on the basic principle that the human parser exploits some information sources while overlooking some others during the early stages of processing (Frazier, 1987; Mitchell, 1987). In spite of little agreement on the information sources the use of which is delayed until reanalysis, a lot of alternatives such as lexical preferences of verbs (Ford et al., 1982), plausibility (Rayner, Carlson and Frazier, 1983), discourse context (Crain and Steedman, 1985), punctuation (Mitchell and Holmes, 1985), case-marking (Trueswell et al., 1993) and so on were examined.

Rule-based parsing models (Bresnan and Kaplan, 1982; Frazier and Rayner, 1982) posit that the parser pursues a single interpretation and it does not become aware of the ambiguity so long as this interpretation is correct. However, if it turns out to be incorrect, the parser initiates reanalysis before long. Considering this basic working principle of the parser, the disambiguating regions in sentences provide us with invaluable information about the processing difficulties the parser goes through. Fodor (1983), one of the earliest proponents of modular theories, defines the language processing system as an independent module encapsulated from other information sources. It is viewed as a mechanism supplying input to the general cognitive system. This "informationally encapsulated", autonomous system neither has access to external information sources nor directly interacts with the other parts of the cognitive system. This implies that only grammatical information is relied upon while making syntactic decisions. In this way, the limited amount of knowledge employed by the parser reduces the memory load and enables it to operate a lot more efficiently. The principles of modularity were subsequently supported by a group of researchers who found out that higher level syntactic and semantic information sources played no apparent role in the activation of word meanings during parsing (Swinney, 1979; Seidenberg, Tanenhaus, Leiman, Bienkowski, 1982).

One of the earliest models in this class of theories is the *Garden Path Model* (Frazier, 1979; Frazier and Rayner, 1982). The basic idea behind this model is that several universal syntactic principles guide the parser and it is these fixed principles that determine the preliminary parsing decisions, even in the case of syntactic ambiguities. In the meantime, other information resources are retained to be used in subsequent revision if needed. Only at this second stage does the *thematic processor* use them to check whether there is a consistency between the initial interpretation of the sentence and non-grammatical information sources. In this way, parsing becomes faster and more efficient as the parser has to bear less computational load. Later on, the quantity and quality of lexical and contextual support determine how costly reanalysis will be.

Of the two most important "conflict-resolution" principles in this model, *minimal attachment* will be explained in some detail due to its direct relationship with the goals of the current study. It is defined by Frazier (1979, p. 24) as "attach incoming material into the phrase-maker being constructed using the fewest nodes consistent with the well-formedness rules of the language under analysis". The parser avoids building unnecessary nodes, so it tends to build the simplest structure with a minimum number of nodes that do not contradict with the grammar of the language. Also, creating new structures is more preferable than getting rid of already existing ones (Ferreira and McClure, 1997, p. 274).

If it comes up with an incorrect interpretation at the end of this process, garden-paths occur, and the initial interpretation is then evaluated and revised. Frazier (1987) proposes that if lexically specific information such as subcategorization information is exploited at these early stages, the scope and generality of the attachment principles will be restricted. Because this will bring about delays in other attachment decisions, the parser generally uses this information in the revision stage. Based on this principle, a temporarily ambiguous noun phrase in a sentence is attached as the direct object of the main verb because it is the simplest and the least costly alternative (Frazier, 1979). Therefore, the main assumption that readers employ non-syntactic information sources during reanalysis causes this approach to be called *lexical filtering* (Frazier, 1987; Ferreira and Henderson, 1990; Clifton, Speer and Abney, 1991).

In the Garden Path model, syntactic ambiguity does not lead to processing disruption at the ambiguous region in a sentence, but rather disruption is delayed because the material that arrived later is incongruent with the initial interpretation (Clifton and Staub, 2008, p. 236). Rayner et al. (1983) attempted to shine a light on the reanalysis process and maintained that thematic processor comes into play at this stage in order to facilitate the construction of a new and more accurate syntactic structure. This specialized device basically provides information about the possible mappings of different thematic roles and syntactic constituents. Plausibility, frequency, prosody, and punctuation are also categorized as the types of information that can play a role solely at the reanalysis stage through the thematic processor (Ferreira and McClure, 1997).

2.4.1.2. *Constraint-based approaches*

An alternative line of research on sentence processing has developed in the constraint- satisfaction framework and these approaches are named *constraint-based approaches, expectation-driven approaches, parallel models* or *multiple representation models* (MacDonald et al., 1994; Trueswell et al., 1994). These are fundamentally based on the principles underlying connectionism, and they look into the parsing issue from a more integrative point of view. As McRae, Spivey-Knowlton and Tanenhaus (1998, p. 284) state, both linguistic and non-linguistic constraints in a language are taken into consideration in the evaluation of possible syntactic alternatives. The success of the human processing system substantially depends on the computation of the interpretation which satisfies all these constraints in the best way possible. Thus, all relevant factors are in continuous interaction- and even competition- with each other in order to make contributions to the decision-making process (Spivey-Knowlton, Trueswell and Tanenhaus, 1993; MacDonald et al., 1994; Jurafsky, 1996). That is why these are also called *interactive models*. These factors accessible during parsing constrain the decisions, if necessary, while readers are making initial interpretations of syntactically ambiguous sentences. In this process, as soon as the comprehender encounters the ambiguous information, all possible interpretations are retrieved and computed simultaneously, which brings about considerable competition among them (Altmann and Steedman, 1988; Just and Carpenter, 1992). The activation and accessibility of each one of these alternatives are weighted and governed by the evidence available in its favor (MacDonald et al., 1994; McRae et al., 1998). Immediate access to semantic and discourse information is claimed to prevent the processor from making incorrect syntactic assignments from the earliest stages.

The most distinguishing feature of interactive accounts is "the parser makes reference to all available information at the earliest possible moment and *foregrounds* (assigns the highest activation to) the most likely analysis" (Traxler, 2005, p. 2). As opposed to the arguments of the modular models, which anticipate processing difficulties at disambiguation regions, interactive models suggest these difficulties can also be observed at ambiguous regions owing to the high demands of the selection process and the cognitive load on the working memory (Clifton and Staub, 2008, p. 238). When the majority of information sources strongly lead the reader to a particular preliminary interpretation but another competitive one ultimately turns out to be correct, garden-paths occur and the readily available, appropriate interpretation is adopted. Its proponents criticize experiments in which isolated sentences are presented because the lack of contextual support in these experiments force readers to rely on syntactic information more than they do in natural language comprehension (Spivey-Knowlton, 1994; 1996; Spivey and Tanenhaus, 1998; McRae et al., 1998).

Constraint-satisfaction approach is essentially motivated by the findings of word-recognition literature. Altmann (1998, p. 147) lists three of these findings as follows:

> *"(1) Multiple meanings of a single ambiguous word are briefly activated.*
>
> *(2) The frequency (or probability) of occurrence of each meaning in the language at large determines the relative degree of activation of the alternatives.*

(3) Biasing contexts can increase the activation of one or other of the alternatives (so that, for example, a less frequent meaning can become activated to the same degree as a more frequent meaning)".

On the basis of these findings, the parser is considered to use lexically specific information and discourse context information at the onset of structuring the linguistic input (Ferretti and McRae, 1999, p. 161). Along the same line, the *selective access model* of word recognition substantiates this explanation postulating that contextual information helps readers come up with only the appropriate meanings of words at the expense of inappropriate ones. As a result, formulation of inappropriate syntactic alternatives is averted from the very beginning owing to limited access to inappropriate lexical information (Boland, 1997, p. 425).

In order to better explain how these models work in ambiguity resolution, Altmann (1998) elaborated on Bever's (1970, p. 147) frequently-cited example below:

(7) The horse raced past the crowd stumbled.

He indicated that at the beginning, a simultaneous retrieval of the multiple meanings of the verb *race* and the argument structures that will possibly follow (e.g. transitivity, alternating argument structures) is observed. Some other factors such as the frequency of its co-occurrence with a past participle or as a main verb, and the frequency of its transitive and intransitive uses also interact, leading to competition. In some other cases, the influence of the contexts in which verbs appear and thematic roles the arguments play can also be influential. For example, in a sentence fragment like "the burglar arrested....", *the burglar* is viewed as a bad agent, while it can be accepted as a good patient or theme. Thus, depending on the context, plausibility can constrain the interpretation of this fragment. As all these factors act independently throughout the interpretation process, they can occasionally be in conflict with one another and the final decision is made with regard to the "graded and dynamically changing alternatives" (Altmann, 1998, p. 148).

The interactive models have developed within the constraint-satisfaction framework covering a wide range of parsing models. Although they have all built consensus on the early use of non-syntactic factors in processing, they differ fundamentally in the strength of the interaction between multiple factors (Crain and Steedman,1985; Altman and Steedman, 1988). Strongly interactive models highlight the significance of the consistency between the syntactic structure constructed and factors such as semantic knowledge, pragmatic knowledge and contextual constraints (e.g.

Marslen-Wilson and Tyler, 1987; Taraban and McClelland, 1988). On the other hand, weakly interactive models are in favor of autonomous syntax. In these, the syntactic processor is also provided with possible alternatives, but independently of contextual information.

In brief, despite several accounts, there are two mainstream theoretical positions. These models with both commonalities and divergences have failed to come up with conclusive results. This is because it is really difficult to make a clear distinction between the initial and subsequent parsing stages when processing temporarily ambiguous sentences which, in and of themselves, have already complex structures.

2.4.2. Verb subcategorization information in modular and constraint-based approaches

The use of verb subcategorization information has been a particularly fruitful ground to test the claims of the sentence processing accounts aforementioned.

The two versions of the Garden Path Model, which proved to be a milestone in the development of serial two-stage models, have not reached an agreement on the use of this information in parsing. The more extreme version proposed by Frazier (1987) and Mitchell (1987) maintains that the parser totally ignores semantic aspects of processing and makes solely syntactic commitments. They argue that this purely syntactic stage only gives access to lexical information such as the part of speech and phrase structure rules, whereas information about case, gender, number and SFs are not available at the beginning. Detailed lexical information is used so as to rule out the previous analyses violating lexical constraints. On the other hand, the less extreme version admits lexical subcategorization information could be employed at early stages of processing (Boland and Tanenhaus, 1991; Frazier, 1990; Gibson, 1990; Tanenhaus, Garnsey and Boland, 1990; Weinberg, 1995). Some scholars from this group proposed *lexical guidance theories*. As cited in Adams et al. (1998, p. 265), the extreme version of lexical guidance theories essentially rests on the suggestion that "specific lexical information is the only source of syntactic structure". They hold that information about verb SFs and their salience is stored in the lexical entries of verbs, making it possible for the parser to retrieve and use this information at the onset (Ford et al., 1982; MacDonald et al., 1994). Less extreme lexical guidance theories also agree that specific lexical information is accessible in the construction of initial commitments; however, they are not so strict as to maintain that it is the "only source of sentence structure" (Boland and Tanenhaus, 1991; Gibson, 1990; Tanenhaus et al., 1990). These lexical models based on lexical-functional grammar (Ford et al., 1982) clarify the process as follows: provided that a verb is likely to appear in several different SFs, the most frequent one is selected for the initial parsing commitments. When the parser comes up with an incorrect interpretation, the next most frequent SF is employed in revision.

As opposed to the garden-path model, constraint-based accounts propose that verb bias information in the encapsulated lexicon is available for early use. *Constraint-based lexicalist account* is one of the models developed in the constraint-satisfaction framework. It contends that knowledge about verbs substantially guides parsing due to the strong constraint verbs put on the possible combination patterns of other constituents in a sentence (Wilson and Garnsey, 2009, p. 369). Thus, it is possible to reduce syntactic ambiguity to lexical ambiguity (MacDonald et al., 1994). MacDonald et al. (1994, p. 683) state that the lexical representation of each word includes the relevant syntactic information as part of it (along with information about its orthographic, phonological, semantic and morphological properties and argument structures). When the parser has access to the word, it can find out about both the types and the likelihood of structures with which that particular word can co-occur. Within this framework, Tanenhaus and Trueswell (1995) also maintain that the selection of the most appropriate syntactic parse is largely dependent on the interaction between the anticipated "lexically projected" structures and prior discourse context - whether it is visual or referential.

Although both models stress the important role of verb subcategorization information in comprehension, they differ in their explanations of when and how this knowledge is exploited by comprehenders. Psycholinguistic research has long begged the question of which of the two widely accepted accounts of parsing will gain more ground in explaining the role of this information source.

2.4.2.1. *Previous studies on verb subcategorization information and the resolution of SC/DO ambiguity in L1*

A large number of studies on verb bias information and its role in ambiguity resolution have been conducted in the monolingual domain (Ford et al., 1982; Connine, Ferreira, Jones, Clifton, Frazier, 1984; Trueswell et al, 1993; Ferreira and McClure, 1997;

Garnsey et al., 1997). The findings of these studies generally support the claims of either modular or constraint-based processing theories. Locally ambiguous constructions used in these studies were expected to induce difficulty for the human processor and elevate the time needed for processing such constructions (Demberg and Keller, 2008, p. 193). As the central focus of the present study is SC/DO ambiguity, research into only these structures will be reviewed in this part.

The use of verb bias information was attended to in several studies and the discussion centered upon the fundamental role of this information source in parsing. The results of the studies conducted so far are far from being conclusive because both delayed effects (Ferreira and Henderson, 1990; Pickering, Traxler, Crocker 2000; Kennison, 2001) and immediate effects of verb bias on the resolution of SC/DO ambiguity were found (Trueswell et al., 1993; Holcomb and Swinney, 1994; Garnsey et al., 1997; Trueswell and Kim, 1998). A short review of these previous studies is presented in Table 2.1 below. More information pertaining to their methodology and results are also provided in the remaining part of this section.

Ferreira and Henderson (1990) investigated the role of verb bias information in the syntactic processing of sentences including SC/DO ambiguity. The results of their eye-tracking and self-paced reading experiments revealed that verb bias information could not prevent readers from misanalyzing the sentences, but it facilitated the reanalysis process. These findings provided evidence for the existence of a robust effect of this information source at later processing stages. They also found that lack of the complementizer *that* induced more processing difficulty for comprehenders. All these results lent countenance to the garden-path model proposed by Frazier and Rayner (1982).

In a subsequent study aiming to put the claims of two frequency-based processing accounts (serial lexical guidance model and serial likelihood model) to the proof, Pickering et al. (2000, p. 452) tried to find out how the processor determines its initial parsing strategy. They conducted three eye-tracking experiments, two of which focused on SC/DO ambiguity. Two sentences from their first experiment can be seen below:

(8a) The young athlete realized her potential one day might make her a world-class sprinter.

(8b) The young athlete realized her exercises one day might make her a world-class sprinter.

In the second experiment, the test sentences from the first experiment were embedded within short passages so as to investigate if reading extended texts rather than isolated sentences would yield similar results. The results showed that the principles of neither the serial lexical-guidance nor the serial-likelihood account were followed by readers in ambiguity resolution. They did not rely on prior context or verb subcategorization frequency, at least in the beginning. Instead, they identified readers' tendency to attach noun phrases to the main verbs even if these interpretations would probably turn out to be incorrect. This is compatible with Frazier's (1979) minimal attachment principle and the claims of restricted, two-stage sentence processing models. Pickering et al. (2000, p. 469) put forward an alternative account and the *principle of informativity*. According to this principle, the likelihood (i.e. the frequency) of a particular analysis and its testability are two main factors guiding the initial parsing preferences of readers.

Kennison (2001) also carried out an experiment which was a partial replication of Trueswell et al.'s (1993, p. 133) prior work and sentences such as (9a) and (9b) were used as experimental stimuli.

(9a) The workers considered the last offer from the management was an insult.

(9b) The workers considered the last offer from the management of the factory.

Table 2.1. *Review of the previous L1 studies on SC/DO ambiguity*

STUDY	EXP.	METHOD	SUBJ.	TASK TYPE	AMB.	BIAS	RESULTS
Holmes et al. (1989)	1	SPR	48	Acceptability	Yes	DO/SC	Rapid effects of verb bias
	2	SPR	40	Repetition	Yes	DO/SC	Rapid effects of verb bias
	3	SPR	48	Comprehension	Yes	DO/SC	Rapid effects of verb bias Plausibility has an effect on the processing of sentences including DO-bias verbs *Supported Constraint-Based Models
Ferreira & Henderson (1990)	1	ET	12	Comprehension	Yes	DO/SC	Bias effects in subsequent reanalysis
	2	SPR	24	Comprehension	Yes	DO/SC	Bias effects in subsequent reanalysis
	3	SPR	24	Comprehension	Yes	DO/SC	Bias effects in subsequent reanalysis * Supported Garden-Path Model and provided little support for verb guidance hypothesis
Trueswell et al. (1993)	2	SPR	40	Comprehension	Yes	DO/SC	Rapid effects of verb bias
	3	ET	24	Comprehension	Yes	DO/SC	Rapid effects of verb bias * Supported Constrained-Based Models
Osterhout et al. (1994)	2	ERP	12	Acceptability	No	DO/SC	Rapid effects of verb bias information (rather than minimal attachment) * Supported Constraint-Based Models
Garnsey et al. (1997)	1	ET	62	Comprehension	Yes	DO/SC/EQ	Rapid effects of verb bias, stronger than plausibility effect
	2	SPR	80	Comprehension	Yes	DO/SC/EQ	Rapid effects of verb bias, stronger than plausibility effect * Supported Constrained-Based Models
Trueswell& Kim (1998)	1	SPR	28	Comprehension	Yes	DO	Rapid effects of verb bias
	2	SPR	42	Comprehension	Yes	DO	Rapid effects of verb bias * Supported Constrained-Based Models

Table 2.1. (Continued) *Review of the previous L1 studies on SC/DO ambiguity*

STUDY	EXP.	METHOD	SUBJ.	TASK TYPE	AMB.	BIAS	RESULTS
Pickering et al. (2000)	1 2	ET ET	40 20	Comprehension Comprehension	Yes Yes	SC SC	DO interpretation is pursued initially. DO interpretation is pursued initially. * Supported Minimal Attachment Principle and restricted two-stage models. *Proposed a new account and the Principle of Informativity
Kennison (2001)	1	ET	36	Comprehension	Yes	DO/SC	DO structures are the default interpretation * Supported Garden-Path Model and provided little support for verb guidance hypothesis
Hare et al. (2003)	1	SPR	45	Comprehension	Yes	DO/SC	Rapid effects of sense-contingent verb bias * Supported Constrained-Based Models
Wilson & Garnsey (2009)	1 2	SPR ET	54 75	Comprehension Comprehension	Yes Yes	DO/SC DO/SC	Rapid effects of verb bias Rapid effects of verb bias * Supported Constrained-Based Models
Mohamed and Clifton (2011)	1 2	SPR SPR	41 45	Comprehension Comprehension	No No	DO/SC DO/SC	Context has an influence on verb bias effects Context has an influence on verb bias effects * Supported neither the garden-path nor the constraint-satisfaction models * Supported a race model in which various factors are permitted in building up a single, initial analysis
Bousquet et al. (2019)	1	SPR	80	Acceptability	No	DO/SC	Rapid effects of structural bias (stronger than global bias effects) * Supported Constrained-Based Models

Note: *ET:* Eye-tracking *SPR:* Self-paced reading *ERP:* Event-related potentials

While Trueswell et al. (1993) found early effects of verb-specific information, Kennison (2001) obtained incompatible results in his item-by-item correlational analyses and participant-by-participant regressions. She found out that SCs were harder to process than DOs regardless of the biases of the preceding verbs. Furthermore, as in almost all experimental studies, it took longer to process ambiguous SC continuations than their unambiguous counterparts. She concluded that his findings challenged the claims of constraint-based models and provided more support for two-stage ones since initial sentence interpretations were not constrained by verb bias information. She also highlighted the fact that different statistical analyses could bear contradictory findings.

Apart from these studies confirming the arguments of modular, two-stage processing accounts, another group of researchers obtained results compatible with the claims of parallel, competitive models.

One of the earliest studies on SC/DO ambiguity was done by Holmes, Stowe and Cupples (1989). Using similar materials in three separate experiments in which different self-paced reading methods were employed, they attempted to test the arguments of modular and constraint-based processing theories. As a result of these experiments, increased reading times were found for sentences lacking the complementizer *that* and containing DO-biased verbs, while the same effect was not found in sentences with SC-biased verbs. On this basis, they maintained that verb subcategorization information was exploited at preliminary stages of syntactic decision-making, which constituted evidence against the garden-path theory. However, Holmes and colleagues' (1989) research was criticized for the self-paced reading methods used, the weak manipulation of verb-bias and the implausibility of the noun phrases in about half of the items.

In a later study conducted in the 1990s, Trueswell et al. (1993) contrasted structurally ambiguous sentence pairs with their unambiguous versions in a self-paced reading time experiment. The only difference between the structurally ambiguous pairs was the bias of the main verbs. A sample set of stimuli was given below (taken from Trueswell et al., 1993, p. 553).

(10a) The student hoped / forgot (that) the solution was in the back of the book.

(10b) The woman hoped / forgot (that) the address was in the directory.

While a large ambiguity effect was found in sentences that contained DO-biased verbs following the disambiguation toward an SC, reading times for ambiguous and unambiguous sentences were similar in the case of SC-biased verbs. The replication of these findings in an eye-tracking experiment revealed that the elevated reading times were at the disambiguation. This displayed that these increases in reading times were related to a that-preference effect. All these findings corroborated the arguments of interactive sentence processing models. However, Pickering and Traxler (1998, p. 957) argued that the degree of commitment to a semantically plausible or implausible parse might have had an influence on the results of this experiment and suggested that plausibility be manipulated in such experiments for more reliable results.

Using a different data collection technique, Osterhout, Holcomb and Swinney (1994) dealt with the SC/DO ambiguity in another study in which they recorded event-related potentials while participants were reading syntactically ambiguous sentences. Of the two experiments they conducted, the first one revealed that the positive-going brain potential P600 was larger when the subjects read sentences including the disambiguating auxiliary words preceded by DO-biased verbs. That is to say, the inconsistencies between the disambiguating words and readers' favored syntactic analyses led to a late positive-going brain potential (P600). This effect is observed when the preferred syntactic reading of a sentence does not enable readers to come up with plausible interpretations, mostly causes them to be garden-pathed and thus requires reanalysis (Friederici, Pfeifer and Hahne, 1993, p. 185). Also, the amplitude of P600 was lower in sentences containing DO-biased verbs and the complementizer *that*. In the second experiment, they aimed at finding out whether readers were inclined whether to apply the minimal attachment principle or to make use of the verb subcategorization information in the resolution of local syntactic ambiguities. Their findings suggested that the parser was more influenced by the verb subcategorization bias information than the syntax-based heuristics. Similarly, in an earlier study in which Osterhout and Holcomb (1992) used the ERP technique, sentences that included violations of verb SFs as well as correct control sentences were used. The P600 component observed in this study was also claimed to be an indicator of both a syntactic error and a garden-path effect which required the reanalysis of these sentences.

Thinking that plausibility may have confounded with verb bias in Trueswell et al.'s (1993) study, Garnsey et al. (1997) investigated readers' use of verb bias and plausibility information in the resolution of this particular type of ambiguity in an eye-tracking study. The experiment included SC-biased, DO-biased and EQ (equi)-biased verbs and the plausibility of the post-verbal noun as a direct object was manipulated. As a result, sentences like (11a) and (11b) were constructed (taken from Garnsey et al., 1997, p. 67).

(11a) The senior senator regretted (that) the decision had ever been made public.

(11b) The senior manager regretted (that) the reporter had ever seen the report.

As can be seen in these examples, *the decision* in (11a) is a plausible direct object for the verb *regretted*, while *the reporter* is not. A rapid effect of verb bias information and an interaction between verb bias and plausibility during online comprehension were found, substantiating the main arguments entertained by interactive, constraint-satisfaction models.

In two self-paced reading time experiments, Trueswell and Kim (1998, p. 112) attempted to use fast priming to determine the extent to which lexical information contributes to online sentence comprehension and how quickly it affects parsing. Sentences with SC/DO ambiguity such as "The photographer accepted the fire could not have been prevented" were read by the participants. They were also briefly shown a prime verb immediately before they read the main verb. The findings indicated that when the matrix verb was primed with a DO-biased verb, the readers were garden-pathed more strongly and thus they had more processing difficulty in the disambiguation region of the SC. However, when the matrix verb was primed with a SC-biased verb, processing was significantly easier. As in the majority of the studies mentioned so far, the findings seemed to endorse the view that lexically specific information can immediately be exploited just as constraint-based models claim.

In their study investigating the roles of the verb sense & subcategorization relationship and discourse context information, Hare et al. (2003) ran a self-paced reading experiment along with four off-line norming studies explained in Section 2.3.1. In this online experiment, participants were asked to read sentences that contained ambiguous and unambiguous SCs. Half of these target sentences were preceded by DO sense-biasing context sentences, while SC sense-biasing ones aimed to promote the SC-biased senses in the other half as in the examples (12a) and (12b) (taken from Hare et al., 2003, p. 301).

(12a) The newspaper editors were arguing intensely and the reporter was having a hard time getting a word in edgewise. *(SC-biasing context)*

Finally though, she inserted (that) the paper seemed to be falling apart and radical change was needed. *(Target)*

(12b) While Bob was sweeping the attic, June was getting frustrated at how hard it was to put the musty old documents back into their boxes. *(DO-biasing context)*

Finally though, she inserted (that) the paper seemed to be falling apart and that she couldn't put it away without ripping it. *(Target)*

As a result, it was reported that priming contexts promoted the intended verb senses and the associated SFs at preliminary stages of processing. It was observed that participants read sentences containing unambiguous SCs preceded by SC-biasing contexts faster compared to the ones preceded by DO-biasing contexts. The main conclusion drawn from this experiment was that sense-contingent subcategorization preferences of verbs considerably guide online language comprehension from the very beginning. Moreover, Wilson and Garnsey (2009) maintained that a rapid reanalysis stage in a serial processing system could have been responsible for the effects found in previous studies. In their self-paced reading and eye-tracking experiments, they used sentences with simple structures that required no reanalysis along with sentences with relatively complex structures. Subjects read sentences including SC-bias or DO-bias verbs and these verbs were followed by either DOs or SCs. Their main concern was to find whether a SC-bias verb followed by a DO would necessarily lead to the reanalysis of the structure. The findings refuted the arguments of modular models and revealed that it was not always easier to process DO complements. However, the match between the verbal complement and the comprehender's expectation was found to facilitate initial processing.

Subsequently, Mohamed and Clifton (2011) designed two self-paced reading experiments to reveal the effect of discourse context information on the resolution of temporary SC/DO ambiguity. Different from the studies reviewed thus far, the DO reading was promoted by the subcategorization properties of the main verbs in the unambiguous items in these experiments. In addition, the priming contexts were constructed so that some of them fostered the DO interpretation (preferred), some SC interpretation (unpreferred) and others provided cues that could support both interpretations (conflicting). Reading times for ambiguous post-verbal NPs in ambiguous and unambiguous sentences were not found to differ significantly and the type of discourse context did not seem to have an apparent effect. Nonetheless, a different pattern was observed in the following region in which the reader was biased towards a DO reading. The interaction between the context information and subcategorization ambiguity produced a significant effect on the reading times of these regions. They contended that these findings fit well with the claims of neither serial nor parallel models. They were compatible with the arguments of an unrestricted race model, which stipulates that multiple factors - not only syntactic simplicity- serve a function in the construction of an initial analysis.

The most recent study dealing with SC/DO ambiguity and investigating the effects of verb bias information and discourse context was carried out by Bousquet et al. (2019). Three variables manipulated in their self-paced reading experiment were named structural bias (frequency of verbs' co-occurrence with specific syntactic structures, that is, verb bias), lexical bias (co-occurrence of verbs and other words) and global bias (use of verbs with specific NPs, i.e. the event or scenario in which they occur - obtained from norming data). The experimental items were similar to the ones in (13a)-(13d) (taken from Bousquet et al., 2019, p. 6):

(13a) The interviewer believed the applicant would be a great fit. (SC-SC)

(13b) The interviewer accepted the applicant would be a great fit. (DO-SC)

(13c) The interviewer accepted the applicant who was a great fit. (DO-DO)

(13d) The interviewer believed the applicant who was a great fit. (SC-DO)

The findings revealed that only structural bias had a significant effect on the reading times in the critical region, while global bias was found to be the most influential in the post-critical region. In addition, the results demonstrated that lexical bias did not have a significant role in the resolution of syntactic ambiguities. These findings imply that verb-specific structural information can be exploited at the earliest stages, whereas readers gain access or prefer using the semantic information in the discourse context in subsequent stages of parsing.

As can be seen in this section, there is not a precise consensus among the researchers on the interpretation of sentences including SC/DO ambiguity although it is possible to say that the findings favor the claims of constraint-based models over modular ones by a wide margin. However, it appears that there is still room for further argument and research into this issue.

2.5. Theoretical Approaches to L2 Sentence Processing

> *[I]n the words of Bley-Vroman (1983, p. 15), "the learner's system is worthy of study in its own right" (p. 4), "on the basis of [its] own 'internal logic'" (p. 15), "not just as a degenerate form of the target system" (p. 4). (Schwartz, 1997, p. 388)*

Given the complexity of language processing, a great deal of research using a wide range of psycholinguistic methods and techniques has been carried out. As a result, a lot has been discovered about the features of human parser and sentence processing in L1. However, relatively little is known about how L2 learners process sentences in the target language.

L2 learners are defined as "non-native speakers who acquired their L2 after childhood and for whom their L1 is the dominant language (Clahsen and Felser, 2006b, p. 117). It has long been discussed whether these people who learn an L2 after fully acquiring their L1 can attain native-like proficiency. Studies which date back to earlier times of this debate focused on L2 learners' general proficiency in the target language (e.g. Johnson and Newport, 1989; DeKeyser, 2000; Birdsong and Molis, 2001) and they produced mixed results. There were studies which found that some of the late L2 learners managed to score within the range of native performance (e.g. McDonald, 2000; Birdsong and Molis, 2001). In another group of studies, differences were observed in the performances of native speakers and L2 learners (e.g. Johnson and Newport, 1989; DeKeyser, 2000). The nature and possible sources of these differences provided another fertile testing ground for SLA researchers.

The first factor that might lead to L1-L2 parsing differences is claimed to be the primary sources of information L1 and L2 speakers employ. To put it all in simple terms, while interpreting ambiguous sentences in L1, children resort to syntactic information and underuse lexical-semantic and discourse context information (Trueswell, Sekerina, Hill, Logrip, 1999; Traxler, 2002; Felser et al., 2003). However, late L2 learners were found to ignore purely structural information and rely on lexical cues and discourse context information (Felser et al., 2003; Papadopoulou and Clahsen, 2003). These different preferences are claimed to result from differences either in their parsing systems or in some other cognitive factors such as working memory capacity.

Another difference on which there is a great deal of agreement is that language learners are slower at processing sentences compared to native speakers, and this indicates that L2 speakers lack automaticity (Segalowitz, 2003). This reduced automaticity is related to the requirement of greater computational effort in L2 parsing and the limitations in cognitive resources. Hopp (2006, p. 370) stated that the need for the incremental computation of phrase structures (Frazier, 1987) and the rapid integration of syntactic, semantic, lexical, morphological and pragmatic information during processing could lead to delays and inefficiencies in non-native processing, or it, if at all, leads to some differences between L1 and L2 processing.

Moreover, cross-linguistic factors have come out as another possible factor that has an influence on L2 parsing. While learners' L1s have been found to be influential on the acquisition of native-like competence in L2 processing in some studies (Frenck-Mestre and Pynte, 1997; Juffs, 2005), others did not come up with any obvious evidence of L1-based preferences (Papadopoulou and Clahsen, 2003; Roberts, Marinis, Felser, Clahsen, 2007).

The final issue likely to lead to differences is the extent to which L2 learners have access to the native language processing system, which is directly related to maturational constraints. One of the models that account for the differences based on the possible effects of the critical period and developmental changes is the *declarative-procedural model*, developed by Ullman (2001, p. 105). He maintained that to what extent L1 and L2 speakers rely on declarative memory and procedural memory brings about the main differences between L1 and L2 processing. In L1 sentence processing, declarative memory is associated with lexical knowledge, while procedural memory is involved in the computation of grammatical rules. L2 speakers show a heavier reliance on declarative memory than on procedural one, unlike L1 speakers. Because of the maturational changes L2 speakers undergo during childhood and adolescence, they either memorize the rule-governed grammatical properties or learn some explicit rules required to construct them by using declarative memory resources. The age at which they start to be exposed to the target language and the amount of practice they do determine how predominantly declarative memory is used in the learning of grammatical rules.

Subsequent to these claims, focusing her attention on the possibility that parsing mechanisms essential for successful sentence comprehension might not be fully available or accessible to L2 learners, Sorace (2011, p. 1) proposed the *Interface Hypothesis*. It contends that if a particular language structure consists of an interface between syntax and other cognitive domains, it is harder for L2 learners to acquire it completely and this could be the fundamental reason why native-like attainment in L2 is inhibited. In other words, she holds the view that L1-L2 processing differences are at the level of grammatical processing and that the main problem is L2 learners are not as good at integrating syntactic information and other information sources as L1 speakers, especially while processing input online.

In addition to these accounts, there are also some others which argue that there are not significant qualitative differences between L1 and L2 parsing (Hopp, 2006; 2010; McDonald, 2006). They assume it is the individual differences such as working memory capacity, reading speed and other cognitive resources that lead to the apparent differences between them.

Due to the inconclusive results of studies investigating the major factors mentioned above and the lack of an empirically-based model of L2 sentence processing, Clahsen and Felser (2006b) proposed the *Shallow Structure Hypothesis* (SSH), one of the primary aims of which was to account for L1-L2 parsing differences.

2.5.1. The shallow structure hypothesis (SSH)

The SSH based its arguments on the claim that the initial interpretations can be made on the basis of simple rules (heuristics) such as "assume the first noun is the subject of the following verb", real-world knowledge, lexical and semantic information (Bever, 1970; MacWhinney, 1987; Ferreira, 2003; Ferreira and Patson, 2007).

The claim to which this hypothesis attributes importance is that there are two different routes in sentence processing that run in parallel. The SSH has borrowed a lot from Townsend and Bever's (2001) *integrated processing model,* which laid the foundation for the idea of two parallel routes in L1 sentence processing. *Full and shallow parsing* routes differ from each other in that they are fed by different information sources. Comprehenders usually rely on structure building rules - that is, grammar- in *full parsing route*. However; "*shallow processing* is guided by lexical–semantic and pragmatic information, world knowledge, and strong associative meaning or form patterns" (Clahsen and Felser, 2006b, p. 117).Starting from this point of view, the SSH predicts that in spite of the availability of both parsing routes, L2 learners mostly follow the shallow processing route either due to deficient and divergent L2 grammar knowledge or the unavailability/inaccessibility of the fundamental parsing mechanisms. This means L2 learners' processing mechanisms are guided by lexical, pragmatic, and world knowledge in the computation of semantic or conceptual representations of sentences, whereas L1 speakers attach priority to syntactic information. Shallow parsing, which was originally used in computational approaches, refers to the identification of parts of speech in a string, the segmentation of input into meaningful chunks and figuring out the semantic relationships between these chunks and the main verb (Hammerton, Osborne, Armstrong and Daelemans, 2002).

Inspired by these arguments of L1 processing theories and different views on L2 acquisition, the SSH proposed that L1 and L2 parsing routines are qualitatively different from each other. Basically, Clahsen and Felser (2006b, p. 113) highlight the need for sufficiently detailed, hierarchical representations so that the parser will be able to make the necessary attachment decisions. However, they hypothesize that these representations might not be available or might lack syntactic detail during online L2 sentence comprehension. The underuse of this information in L2 processing results in native-like grammatical processing performance only in local domains. Thus, long-distance dependencies and ambiguous sentences pose a real challenge for L2 learners (Felser et. al., 2003; Papadopoulou and Clahsen, 2003; Marinis et al., 2005). Clahsen and Felser (2006b, p. 112) also argue that L2 learners do not differ much from native speakers when sensitivity to argument structure, plausibility information and thematic information is concerned, and they base this argument on the findings of several studies (Williams et al., 2001; Felser et. al., 2003; Papadopoulou and Clahsen, 2003).The hypothesis also endorses the universality of the basic parsing mechanisms, and thus the use of parsing heuristics such as minimal attachment by L2 learners. In other words, despite the essentially same processing systems of L1 and L2 speakers, the fundamental differences between L1 grammar and the interlanguage grammar of L2 learners cause non-native-like processing (Bley-Vroman, 1990). This claim thus underlines the need for rich, implicit grammatical knowledge for native-like processing (Clahsen and Felser, 2006b, p. 118). Finally, the hypothesis posits that it is not possible to account for the differences between L1 and L2 processing depending on factors such as processing speed, working memory, properties of L1 and L1 parsing routines, exposure to L2 or insufficient knowledge of L2 grammar (Clahsen and Felser, 2006a, p. 29). This implies that shallow processing is a common trait of all L2 learners and that the differences are qualitative, not quantitative.

Clahsen and Felser (2006a, p. 34) also add that shallow processing is not restricted to L2 processing as it can sometimes be observed in native speakers. In order to provide evidence for this claim, they make reference to Fodor's (1995) *depth of processing hypothesis*, Sanford and Sturt's (2002) *underspecification account*, and Ferreira, Ferraro and Bailey's (2002) *good enough processing* as some of the ideas put forward with the aim of shedding more light on the role of the shallow parsing route in L1 processing.

Due to the scarcity of findings that fully confirm or challenge the arguments of the Shallow Structure Hypothesis and its applicability only to a limited number of syntactic structures, there is still a definite need for further research in this area.

2.5.2. An overview of previous studies on L2 processing

Putting a spotlight on the need for more sentence processing research in L2 contexts, Dussias et al. (2010, p. 1004) point out that most of the people in the world are bilinguals so the validity and generality of the L1 acquisition theories can be questioned unless bilingual data is added to the findings obtained in the monolingual domain. Starting from this point of view, a number of scholars designed studies examining how L2 learners process ambiguous sentences of varying syntactic structures. Their primary goal was not only to test the generalizability of L1 theories to L2 processing but also to determine whether or to what extent L1 and L2 parsing strategies differ.

The first view emerged as a result of the findings of the studies which demonstrated that the way the parser constructs representations in L1 and L2 was identical and thus the ultimate sentence representations were similar. The argument based on the use of a fixed, universal set of parsing strategies in both L1 and L2 (Dussias, 2003, p. 530) is reinforced by the results of several studies (Frenck-Mestre and Pynte, 1997; Juffs, 1998; Dussias, 2003; Hopp, 2006; Williams, 2006; Jackson, 2008; Jackson and Dussias, 2009; Tokowicz and Warren, 2010; Jegerski, 2012). It was proposed that L2 parser bears a close resemblance to L1 parser in that it sticks to the economy principle while computing representations. However, processing difficulty is induced when the comprehenders' initial representations and the subsequent input they encounter are incompatible (Juffs and Harrington, 1996; Frenck- Mestre and Pynte, 1997; Juffs, 1998; Hopp, 2006; Dussias and Cramer Scaltz, 2008; Jackson, 2008)

Another camp hold that L2 learners' syntactic representations are less detailed due to their inadequacy to use structural information as well as L1 speakers do (Kroll and Dussias, 2004; Clahsen and Felser, 2006b; Felser and Roberts, 2007; Clahsen and Neubauer, 2010; Pan and Felser, 2011; Jessen and Felser, 2019). This claim that L2 learners usually have difficulty in the area of grammatical processing revealed L2 learners cannot recover from misanalysis as easily as L1 speakers can (Juffs and Harrington, 1996) Moreover, low proficiency level (Jackson, 2008) and more complex input (Roberts and Felser, 2011) have turned out to be the two factors that make recovery more difficult. Roberts, Gullberg and Indefrey (2008) also suggest that L2 speakers are not as competent at integrating grammatical information with other information sources as L1 speakers. It is obvious that these results provide further evidence for the justifiability of the SSH by displaying the qualitatively different nature of L1 and L2 sentence processing.

Finally, in addition to the research dealing with cross-linguistic interference and L1 transfer (Frenck-Mestre and Pynte, 1997; Juffs, 1998; MacWhinney, 2002), the dissimilarities in L1 and L2 processing were also attributed to individual differences. This view is endorsed by the proponents of the *Fundamental Difference Hypothesis* put forward by Bley-Vroman (1990). The main suggestion of the theory is that adult L2 learners may not have access to the universal acquisition mechanisms guiding the L1 development of children. Therefore, due to the inaccessibility of universal grammar (UG), the development of L2 grammar relies on L1 grammar. Under this view, individual factors such as insufficient L2 proficiency (Hahne, 2001; Frenck-Mestre, 2002; Hopp, 2006; 2015; Jackson, 2008), working memory limitations (Williams, 2006; Havik et al., 2009; Dussias and Piñar, 2010; Hopp, 2015), cross-linguistic differences (Sabourin and Haverkort, 2003; Hopp, 2006; 2010; Roberts et al., 2008) and L1 transfer (Weber and Cutler, 2004; Hernandez, Li and MacWhinney, 2005) are assumed to lurk beneath the failure of L2 speakers in attaining native-like competence. In conclusion, the effects of individual variables are not yet an issue that has drawn all the attention it deserves but more comprehensive work on these variables is likely to provide new insights into L2 sentence processing.

In sum, a short review of the related work demonstrates that the results are mixed, and the findings highlight the existence of both similarities and differences between L1 and L2 processing of temporarily ambiguous sentences.

2.5.2.1. *Previous studies on verb subcategorization information in L2 contexts*

Due to the complexity of the probabilistic relations between verbs and their SFs, it appears to be a formidable challenge for L2 learners of English. Thus, some studies were carried out to illuminate different aspects of the acquisition and use of L2 subcategorization information.

The earliest research on verb subcategorization mainly dealt with the acquisition order of different types of SFs across groups of participants with different L1 backgrounds. Almost all of these studies discovered that infinitival complements were acquired and produced earlier than gerundials (Koike, 1983; Mazurkewich, 1988; Cook, 1996; Keawchaum, 2017) and in cases in which the verbs allow both forms, the participants preferred using infinitives, especially at lower proficiency levels (Wakabayashi, Hokari, Haniu, Fujimoto, Kimura, 2017). Also, it was found out *that*-complement was acquired later than gerund and infinitive constructions (Hart and Schacter, 1976; Ioup, 1983; Mazurkewich, 1988; Cook, 1996). These findings were explained by Andersen (1978) and many others through *economy principle*, which encourages learners to learn shorter forms earlier than the others.

A study was conducted by Uçkun (2012) in the Turkish context with university-level L2-English students. An off-line sentence completion task including polysemous verbs with DO-biased and SC-biased senses was administered to identify L2 learners' use of sense-contingent SFs. In this partial replication of Hare et al.'s (2003) study, she also looked into developmental effects and L1 influence. The results indicated that the knowledge of sense-contingent subcategorization affected L2 learners' preferences regardless of their proficiency levels. The replication of the study in Turkish indicated that participants' L1 could not account for the frequent use of SCs and the underuse of DO structures. Although this study did not deal with L2 learners' real-time interpretation, it has a place in the literature as one of the very few studies focusing on L2 learners' awareness of the link between verb sense and subcategorization.

In a more recent study, Sung and Kim (2019) compared L1 and L2 English speakers' use of lexical and constructional knowledge of argument structures. The analysis of the transitive argument structures in a native speaker and a learner corpus revealed that L2 learners had inadequate lexical knowledge and used the simplest argument structures.

They concluded that both insufficient lexical and constructional knowledge were responsible for the difficulties experienced in the production of argument structures.

Upon becoming aware that there is little research into the possible link between verb subcategorization and the processing of L2 constructions, a number of scholars set out to investigate whether this information source is used by L1 and L2 speakers in the same way during on-line language comprehension. In the studies summarized in this section, stimuli containing temporary SC/DO were constructed.

On the basis of the previous research in L1, Dussias and Cramer (2006) attempted to find out whether the comprehension of sentences with temporary SC/DO ambiguity read by proficient Spanish-English bilinguals would be influenced by English verb bias information and L1 cues. For their experiments, they selected cases in which verb bias information in these bilinguals' two languages are incongruent. In this way, they intended to find out how this conflict would be modulated during the construction of initial syntactic assignments. The results from an off-line norming task and a self-paced reading experiment demonstrated that L2 learners had the ability to extract verb bias information from the input. Additionally, when they lacked L2 verb bias information, L2 parsing did not rely on universal principles, but on L1 information. Their findings supported the claims of constraint-based lexicalist theories, especially those of the models that emphasized the role of statistical frequency.

In another self-paced reading time experiment, Dussias and Cramer Scaltz (2008) used the experimental items constructed by Wilson and Garnsey (2001). The results indicated that it took longer for L2 English speakers to read the disambiguating word if the structure of the sentence was incompatible with the verb's bias. This suggested L2 speakers made use of verb bias information while parsing in L2. They also stated that various information sources stored for L1 and L2 (in bilinguals' cognitive systems) were resorted to depending on the target structure to be processed and the input provided. It was concluded that verb bias information guided both L1 and L2 sentence processing and this study provided further evidence for a model developed within the constraint-based lexicalist framework (MacDonald et al., 1994; Trueswell et al., 1994).

In a more recent self-paced reading study by Lee et al. (2013, p. 765), the use of verb bias and complementizer cues by L1-Korean learners of L2-English was investigated. They included two groups of learners with different English proficiency levels to see the possible influence of developmental factors on L2 parsing. Selecting SC/DO ambiguity as the target structure inducing difficulty in their study, they created sentence pairs like the ones seen below:

DO-bias verb

(14a) The club members understood the bylaws would be applied to everyone.

(14b) The club members understood that the bylaws would be applied to everyone.

SC-bias verb

(14c) The ticket agent admitted the mistake might be hard to correct.

(14d) The ticket agent admitted that the mistake might be hard to correct.

Their findings were mostly consistent with those of previous studies, revealing that the participants showed evidence of using verb bias and complementizer cues in the prediction of upcoming syntactic structures. Also, they found that native-like efficiency in the combination of these information sources/cues in L2 processing can only be achieved at a high level of L2 proficiency.

Focusing on the same type of ambiguity and having similar research goals, Anible, Twitchell, Waters, Dussias, Pinar and Morford (2015) looked into the American sign language - English bilinguals' sensitivity to verb bias information in not only production but also real-time sentence processing. They conducted an eye tracking experiment using Wilson and Garnsey's (2009) experimental stimuli. The eye movement records demonstrated that even if a language learner was exposed to an L2 primarily via print, he could acquire and use frequency-based verb bias information in not only sentence production but also in making parsing decisions.

As it can obviously be seen in this section, there exist only a handful of L2 studies dealing with the use of verb bias information in the production and comprehension of language. Furthermore, the ones that are available seem to mostly ignore semantic properties of verbs.

2.6. The Role of Discourse Context Information in Sentence Processing and Previous Studies

It is a well-accepted fact that the incremental processing of words and structures is an important part of sentence processing; however, making predictions about ensuing words or structures is also of vital importance. In natural language comprehension, humans do not process sentences in isolation; instead, they make use of other information in the context to a great extent. Taking this as a starting point, Brady (2008, p. 1) stated that while making predictions during sentence processing, comprehenders exploit not only the semantic and syntactic information the sentence conveys but also information from previously encountered sentences. One of the most plausible explanations about how it occurs is that comprehenders integrate information across sentences in order to construct a global representation or *discourse context* (Traxler, Foss, Seely, Kaup, Morris, 2000; Cook and Myers, 2004). There is plenty of evidence that discourse context can help comprehenders resolve structural ambiguities (Altmann and Steedman, 1988; Britt, Perfetti, Garrod, Rayner, 1992; Spivey and Tanenhaus, 1998), lexical ambiguities in structures involving polysemous verbs (Vu, Kellas, Metcalf and Herman, 2000; Hare et al., 2003) and predict upcoming words (Schwanenflugel and White, 1991; Sharkey and Sharkey, 1992; Hess, Foss and Carroll, 1995; Cook and Myers, 2004). This brought along the assumption that discourse context information could play a role in predicting upcoming verb subcategorizations (Brady, 2008, p. 2).

The researchers studying discourse context effects held two partly conflicting views. Although they mostly agreed on the presence of such an influence, different sentence processing theories put forward dissimilar opinions about when it becomes effective. Proponents of constraint-based theories maintained that discourse-level comprehension affects readers' initial parsing decisions (Crain and Steedman, 1985; Altmann and Steedman, 1988; Altmann, Garnham and Dennis, 1992; Britt et al., 1992; Altmann, Garnham and Henstra, 1994), while modular accounts claimed these effects are delayed (Ferreira and Clifton, 1986; Mitchell et al., 1992; Rayner, Garrod and Perfetti, 1992).

Although there is a lot of research aiming to explain these effects, information about the methods, the stimuli and the findings of only some of the most prominent studies on this issue are presented below.

Following Holmes's (1984) pioneering work that will be explained in more detail below, Crain and Steedman (1985) made an attempt to develop some criteria for the construction of effective discourse paragraphs that intended to facilitate the resolution of syntactic ambiguities. They based this study on Crain's (1980) research in which participants were provided with a word-by-word grammaticality judgment task including sentences like (15a) and (15b) as well as preceding context paragraphs like (16a) and (16b) (taken from Ferstl, 1993, p. 38):

(15a) The psychologist told the woman that he was having trouble with her husband. *(that-complement)*

(15b) The psychologist told the woman that he was having trouble with to visit him again. *(relative clause)*

(16a) A psychologist was counseling a man and a woman. He was worried about one of them but not about the other. *(context sentence supporting that complement interpretation)*

(16b) A psychologist was counseling two women. He was worried about one of them but not about the other. *(context sentence supporting relative-clause interpretation)*

The findings demonstrated that the participants mostly judged the target sentences as grammatical when these sentences were compatible with the preceding contexts. Although the effect of contextual information was proven, this study was criticized for not making contextual effects clear in on-line processes as it did not measure reaction times.

Then, in two self-paced reading experiments performed by Altmann and Steedman (1988), the influence of discourse context on the processing of structurally ambiguous prepositional phrases was examined. The sentences that contained locally ambiguous prepositional phrases and were preceded by contexts were taken from Crain (1980) and only minimal changes were made. The findings revealed that sentences were processed faster when preceded by contexts supporting the attachment biases of these sentences, thereby indicating the effectiveness of context manipulation. The signs for processing difficulty and early differences in reading times at the disambiguation region indicated that discourse information was active while readers were making their initial parsing decisions, providing support for interactive sentence processing accounts.

Moreover, Altmann, Garnham and Dennis (1992) carried out two eye movement studies including the ambiguous relative/complement sentences in order to find out if pragmatic factors affect the parsing preferences of the processor. The findings of the first experiment revealed that all differences in first pass reading times of the participants were eliminated by means of the contexts provided. The second experiment also confirmed the findings of the first one demonstrating that early parsing decisions are influenced by the context information.

In another study, Britt at al. (1992) investigated whether syntactic parsing preferences of readers could be deactivated by the discourse context information. They conducted an eye-tracking and two self-paced reading experiments in which participants read garden-path sentences including post-nominal prepositional phrases and reduced relative clauses. All these sentences were preceded by neutral and biasing contexts. They revealed that following neutral contexts, participants had greater difficulty in processing final disambiguation regions in non-minimal attachment cases compared to minimal attachment ones. On the contrary, following biasing contexts that support a particular reading, no such differences were observed. In brief, the results pointed to the immediate effect of discourse context on the resolution of syntactic ambiguity, supporting the findings of previous studies. However, the results of their self-paced reading task dealing with reduced relative clauses failed to support the influence of discourse context.

Similarly, Altmann, Garnham and Henstra (1994, p. 69) set out to invalidate Mitchell et al.'s (1992) argument that the parser's initial decisions are guided by purely syntactic rules, not by discourse context. Finding Mitchell et al.'s (1992) contexts ineffective, they designed an eye-tracking experiment including sentences with the same grammatical structure, but the contexts were constructed differently. The findings demonstrated that contextual differences brought about different expectations of sentence continuations at early processing stages.

Sharing a similar goal, Spivey and Tanenhaus (1998) investigated how discourse context influences the temporarily ambiguous sentences that could initially be read both as a reduced relative clause and a main clause. These sentences were also preceded by either two-referent contexts promoting the reduced relative interpretation or one-referent contexts supporting the main-clause interpretation. The overall results displayed that the influence of discourse context in ambiguity resolution was reflected in first pass reading times, which was a sign of its active role in early comprehension.

In a more recent study, Yang, Mo and Louwerse (2012) attempted to examine the possible influence of local and global discourse contexts on the processing of subject and object relative clauses. It was revealed that although syntactic information could be the primary source in processing isolated sentences, the ones presented with appropriate contexts are processed in the way interactive models of parsing suggest.

The findings of the studies mentioned so far seem to provide support for the predictions of constraint-based models as they all found rapid effects of discourse context information. However, there is another camp that ended up with findings favoring the suggestions of modular two-stage theories.

To begin with, the earliest off-line study which aimed to verify the assumptions of the minimal attachment principle, and more specifically Kimball's (1973) Right Association and Verb Dominance Principles, was conducted by Holmes (1984). One of the structural ambiguities focused on in this study was the attachment of prepositional phrases as in example (17) below:

(17) The parents discussed the problem with the mathematician.

Minimal attachment principle posits that in this type of sentences readers are inclined to attach the PP *with the mathematician* to the verb *discussed* rather than to the NP *the problem.* In order to test whether this syntax-based rule applies to the interpretation of various syntactic structures, the participants were asked to decide whether there was a consistency between the target sentences and the preceding context paragraphs presented. These paragraphs were intended to bias the reader towards one of the readings. Below are the last sentences of two of these context paragraphs:

(18a) The parents discussed with the math teacher what could be done about the difficult exam, but no solution was reached. *(supporting minimal-attachment - VP)*

(18b) The parents discussed among themselves what could be done about the math teacher, but no general agreement was reached. *(not supporting minimal attachment - NP)*

The analysis of the participants' preferred readings revealed that comprehenders almost always relied on phrase structure rules first and checked the meanings conveyed by these structures against their earlier analyses. They followed this procedure regardless of whether they were reading single sentences or sentences accompanied by context sentences. This was assumed to confirm Mitchell and Green's (1978, p. 256) *backward integrative processing* view and *minimal attachment principle* while downplaying the role of contextual factors at initial stages.

In another research study, Ferreira and Clifton (1986) sought to compare the effects of semantic content and pragmatic context. To this end, they conducted a self-paced reading experiment and two eye-tracking experiments including locative prepositional phrases and reduced relative clauses in syntactically ambiguous sentences accompanied by neutral and biasing contexts. It was found that even in cases where syntactic processing biases led to an anomaly or were in conflict with discourse biases, they were still in effect. They suggested that a syntactic processing module exists, and discourse context information is not of primary importance while making initial parsing decisions. As for the significant increase in the second pass fixation times, they were signs of the facilitative role of well-chosen contexts in recovery from garden paths at the subsequent reanalysis stage.

Mitchell, Corley and Garnham (1992) also conducted two self-paced reading experiments with three target sentence types, two context types and unambiguous control sentences. The targeted structures were *that*-complements, subject relative clauses with *that* and object relative clauses with *that*. In the second experiment, they added complement-supporting and relative-supporting contexts. The findings indicated that discourse context information affected only the ultimate parsing decisions, providing evidence for modular models such as the Garden Path Model.

To the best of our knowledge, two most recent studies on the role of syntactic complexity, verb bias and global/semantic context information in the resolution of temporary syntactic ambiguity were carried out by Mohamed and Clifton (2011) and Bousquet et al. (2019). What these two studies had in common was that their eventual aim was not being a party to the debate over whether modular or interactive models of parsing definitively explain the process. For example, Mohamed and Clifton (2011) intended to cast light on the resolution of temporary SC/DO ambiguity. Their careful analyses of the participants' reading times in the ambiguous and disambiguating regions demonstrated that the overall processing pattern fit perfectly with the predictions of neither serial models nor competitive constraint-satisfaction models. Instead, they put a spotlight on the claims of an unrestricted race model that proposes the speed of building initial syntactic analyses is determined by multiple factors. Likewise, Bousquet et al.'s (2019) results suggested that both syntactic and semantic information sources are exploited in the resolution of structural ambiguities. However, the parser had access to syntactic knowledge immediately, whereas discourse context information proved increasingly effective in the ensuing stages of processing.

As the review of the related studies indicates, a crystal-clear picture of language processing has not been provided by studies investigating the possible effects of contextual information. The inconsistencies in these findings show that the role of non-syntactic information such as discourse context in syntactic processing will probably continue to be a focus of interest for psycholinguists.

2.7. Eye-Tracking as a Psycholinguistic Data Collection Technique

A painstaking investigation into the processing of ambiguous sentences or ungrammatical utterances in numerous studies required the use of methodologies and techniques that would tap into the comprehension processes in real time. One of these techniques has turned out to be eye-tracking because people are considered to make sense of the world around them through their eyes. Therefore, it is assumed that people's eye movements could provide us with a rich source of information about their perception and processing, thereby bringing the eye-tracking technique into the forefront in psycholinguistic research.

In eye-movement monitoring, target sentences are presented on a computer screen and the eye movements of a subject reading these sentences are recorded. The ultimate goal is to provide subjects with the opportunity to read for comprehension in a way similar to natural reading. Follow-up comprehension questions or paraphrasing tasks are also commonly used to make sure that the subject has read the target sentences/texts for comprehension. This procedure followed in eye-tracking studies renders it a practical way of learning about people's online comprehension processes.

There are several reasons why eye-tracking has been favored as a psycholinguistic technique. First, it opens up the possibility of the examination of moment-to-moment processing, which helps researchers come up with the reading patterns of participants easily. Since eye movements are good indicators of the difficulties encountered by readers during sentence processing (Rayner, 1998, p. 387), they provide insight into the parsing strategies adopted by different groups of readers. Another advantage is that it provides an opportunity to examine early and late stages of online processing separately and provides researchers with multidimensional and detailed findings (Roberts and Siyanova-

Chanturia, 2013, p. 221). Early measures in an eye-tracking experiment such as first fixation durations are the indicators of early comprehension processes like access to lexical information, whereas late measures such as total reading times are strongly related to the reanalysis of the information encountered, the integration of discourse information and recovery from the processing difficulties (Rayner et al., 1989). Rayner (1998, p. 377) highlights the importance of the analysis of both stages saying "any single measure is a pale reflection of the reality of cognitive processing and is of limited value in measuring online processing". Eye-tracking also gains an advantage as the reading rate is about two times faster in an eye-tracking study compared to that in self-paced reading experiments (Rayner, 1998). Also, compared to the other techniques investigating the psycholinguistic processes, eye-tracking is non-intrusive and it creates a relatively natural atmosphere for reading (Duyck, Van Assche, Drieghe, Hartsuiker, 2007) due to its convenience for readers and researchers. The participant-friendly nature of eye-trackers and the availability of ready-made software packages used in data analysis have boosted its popularity in recent years.

As the present study deals with L2 processing and ambiguity resolution, it is essential to better understand the fundamentals of the eye-tracking technique utilized in these types of studies. Although it usually occurs to us that our eyes move smoothly across a text while reading it, their movements are, in fact, not smooth. The movements of eyes during reading are mainly categorized as *fixations* and *saccades*. Eyes make a series of rapid jumps from one location to another which are called *saccades*. Due to the high speed of saccades, readers perceive only a blur and thus no new information input is encoded during these movements (Rayner, 2009, p. 1458). However, while trying to recognize a particular word in a text, eyes dwell on a particular point in the visual stimuli and remain fairly stable for a certain period of time between these saccades. These stationary periods are termed *fixations* and readers register new meaningful information during fixations (Just and Carpenter, 1980; Rayner, 2009). The numbers and durations of these fixations are analyzed in studies on sentence processing because they are useful information sources about the characteristics of the texts being read (Roberts and Siyanova-Chanturia, 2013, p. 215). In addition, not all saccadic movements are forward. Eyes sometimes move from right to left, and these backward movements called *regressions* comprise approximately 10-15% of all saccades (Rayner, 1998; 2009). The lengths of regressions reveal whether the processing difficulties are specific to the word or they are related to the larger context (Roberts and Siyanova-Chanturia, 2013, p. 216). For example, Rayner (1998, p. 376) proposes that the increasing conceptual difficulty of a text causes fixation durations and the frequency of regressions to increase and the saccade lengths to decrease.

In all eye-tracking studies dealing primarily with the basic principles of online reading, the numbers and durations of fixations as well as saccadic length on the experimentally manipulated areas of sentences or texts (called *area of interest*) provide detailed information about cognitive processing (Rayner and Sereno, 1994) as they indicate difficulties in comprehension (Rayner and Pollatsek, 1989; Rayner, 1998). For example, shorter saccades, longer fixations and more regressions are evidence for poor reading abilities (Rayner, 1998; Ashby, Rayner and Clifton, 2005).

In order to better understand what the findings in an eye-tracking study suggest, definitions of some measures used in the eye-tracking paradigm are required. While a reader is scanning a line of text, his eyes leave a trace. This trace can be split into some measures. Some of these measures computed in the present study are explained below.

First Run Dwell Time (First Pass Reading Time): Upon encountering a target region (AOI) for the first time, a reader makes an initial fixation and, if needed, regressions and re-fixations. The total time spent during these fixations and re-fixations is called first-pass reading time. This early measure is thought to index "processes that occur in the initial stages of sentence processing" (Clifton, Staub and Rayner, 2007, p. 349) like word recognition, while late measures such as second-pass reading time and regressions reflect reanalysis and provide proof about the later stages of parsing.

Regression (out): It is a kind of saccade moving back in a particular text as opposed to the usual forward movement of eyes during reading. Rayner (1998) posits that of all the saccadic movements, around 10-15% are regressions which provide the reader with the opportunity to return to and re-examine an earlier part of the text. While short regressions indicate difficulties in processing a particular word, longer regressions are caused by larger sentential contexts. The reasons for more and longer regressions are usually garden paths, polysemous words and general text difficulty (Rayner and Pollatsek, 1989).

Regression Path Duration (Go-Past Reading Time): It refers to the time from the first fixation on a particular word until the fixation progresses to the right of that word or region. Regressions back in the text are also included in go-past reading time. It is claimed to reflect "the time it takes upon reading the target word on first pass until it is successfully integrated with the on-going context" (Rayner and Pollatsek, 2006, p. 620). What makes it different from other reading measures is that it enables researchers to have an idea about higher order reading skills such as syntactic and semantic integration (De Groot, 2011).

Dwell Time (Total Reading Time): It is used to refer to the sum of first and second pass reading times for a particular region of interest. It includes all fixation durations within a single area of interest and tells us the total time the reader spends for reading that area. It is also considered to include both the initial processing time and the time a reader spends to reread the text and recover from processing difficulties (Liversedge, Paterson and Pickering, 1998, p. 58). Regardless of whether an area of interest includes a single word or a longer phrase, it is possible to make use of total reading time as a reading time measure in eye-tracking studies.

All these measures enable researchers to see how long a target area is fixated or re-fixated and whether or not some words are skipped. They also account for various processing difficulties experienced by readers and their reactions or strategies used at different stages of processing. Frenck-Mestre (2005a, p. 178) stated that several dependent variables can be included in eye-tracking experiments and the data gathered can show us exactly when (during the first pass or the second pass while reading a sentence) and where (at the ambiguous region or the disambiguation region, etc.) readers have processing difficulties. It also gives us clues about how readers overcome these difficulties (i.e., fixating on a particular word/phrase longer, rereading a region or making a regression).

In the majority of eye-tracking research into the nature of syntactic parsing, either temporarily ambiguous sentences or sentences including semantic/syntactic anomalies are used to discover processing difficulties and to test the predictions of processing theories. In the first group of studies , participants' eye movements in ambiguous regions and control areas are observed while they are reading temporarily ambiguous sentences. Researchers reached a consensus on the fact that the required cognitive load brings about longer fixations, longer reading times and more regressions in the ambiguous regions (Frazier and Rayner, 1982; Clifton, 1993). Likewise, the second group of studies dealing with semantic and syntactic plausibility revealed that syntactically and semantically anomalous sentences usually result in longer fixation durations and regressions (Murray and Rowan, 1998; Pearlmutter, Garnsey and Bock, 1999). Therefore, it is clear that, whether they be ambiguities or anomalies, structures that are more difficult to process take longer to read and lead to regressions or rereads.

Due to the advantages listed above, SLA researchers attempted at combining traditional data collection techniques with psycholinguistic techniques such as eye-tracking. This combination is of vital importance as acquisition of an L2 requires "both the accumulation of second language (L2) knowledge and the ability to put that knowledge to use during real-time processing" (White, 2003; cited from Roberts, 2012, p. 113). As well as rendering it possible to capture the processing difficulties of L2 learners, these techniques open up opportunities to compare the performances of native and non-native speakers as well as those of L2 learners at different proficiency levels.

The eye-tracking paradigm as a psycholinguistic technique has been used extensively in both L1 and L2 processing studies in recent years owing to its practicality and versatility. All things considered, it seems to be the most appropriate technique for the present study on condition that it is complemented with some off-line measures such as sentence completion tasks.

3. METHODOLOGY

3.1. Introduction

The present study essentially attempts to investigate how L1 and L2 speakers of English make use of verb subcategorization and discourse context information while producing and comprehending sentences in English. It also aims to evaluate the findings within the framework of the two broad classes of L1 sentence processing theories (serial vs. parallel). The final aim of the study is to compare the parsing preferences of L1 and proficient L2 English speakers in the resolution of temporary SC/DO ambiguity. The main arguments of the Shallow Structure Hypothesis are taken into consideration in the evaluation of the strategies employed by L2 speakers. As the topic in question falls within the scope of psycholinguistics, which mainly deals with the mental processes involved in the production and perception of written and spoken discourse, psycholinguistic techniques are utilized in the data collection process.

The present chapter begins with the introduction of the research design and explanations about the selection of the target verbs. Then, the pilot study will be presented, including the participants, instrument, data collection and analysis procedures, and the results. Afterwards, the aim, procedure and results of the corpus testing will be reported. The subsequent sections will present information about the participants, data collection instruments and the procedures followed in the collection and the analysis of the data collected in Experiments 1, 2 and 3.

3.2. Research Design

As the present study aims to provide evidence either supporting or refuting the assumptions about the use of various information sources in L1 and L2 sentence processing, it requires a quantitative design oriented towards testing theories. In this design, data is gathered and analyzed using statistical approaches in order to explain the phenomena in question (Aliaga and Gunderson, 2000). As Marshall (1996) states, one of the most important factors that make quantitative research stronger is that the quantifiable and reliable nature of the data paves the way not only for generalizing it to a large population but also for testing and validating already constructed hypotheses or theories. Moreover, the data collected from large groups of participants in a wide range of settings through well-controlled procedures renders it possible to replicate a particular piece of research. The current research is quantitative in nature on the grounds that some research questions were specified to test specific L1 and L2 sentence processing theories, the data were collected to provide further evidence supporting or contradicting their arguments, and statistical procedures were employed in the data analyses.

In the first part of this study, a pilot study was conducted to determine the verbs to be used in the main experiments. As a second step, a small-scale corpus testing was done, and existing data extracted from a corpus were analyzed in order to obtain the frequencies of occurrence of the syntactic constructions under investigation. The procedure followed and the results of the corpus testing will be explained in the subsequent sections of this chapter. The aim of this analysis was to form a sound basis for the assumption that there is a relationship between verb sense and SFs (e.g. Roland, 2001; Hare et al., 2003), and thus to provide support for the claim that the verbs included in the present study have sense-contingent biases. Finally, the main data were obtained through the three experiments in which different behavioral techniques (i.e. sentence completion and eye-tracking) were used. The procedure used in these experiments was *quasi-experimental* due to the non-randomized assignments of subjects (Keppel, 1991). Also, the sampling method used was *convenience sampling* (also known as haphazard or accidental sampling). That is, naturally formed groups or volunteers available to the researcher participated in the experiments due to the multi-stage nature of the study and the need for gathering data from two distinct groups of participants (L1 vs. L2 English speakers) in two different settings.

With regard to the use of methods and techniques in data collection, controlled experiments were conducted. In these experiments, a manipulated independent linguistic variable is determined and how this manipulation affects the dependent variable is examined (Garrod, 2006). Thus, in the current experimental study, verb subcategorization information was manipulated in some of the experimental items in order to observe the participants' production preferences and ambiguity resolution strategies when their syntactic expectations were violated. In conformity with the psycholinguistic tradition, both off-line and on-line behavioral techniques were adopted as they "complement each other, with off-line techniques used to determine the outcome of interpretation and on-line techniques used to determine its time course" (Garrod, 2006, p. 251). Eye-tracking data were integrated with off-line measures so that the end product of learning could be exploited as suggested by Winke, Gass and Sydorenko (2013).

3.3. Selection of the Verbs Used in the Experiments

Verbs whose overall subcategorization preferences differ from their sense-specific preferences are the main focus of the present study, which required a careful selection of the verbs that fall into this category. To this end, the literature on verb SFs and verb bias was used as a guide to determine verbs' overall subcategorization preferences and the results of the related norming studies and multi-corpora analyses were examined. The lists of verbs categorized as DO-biased (direct object biased), SC-biased (sentential complement biased) and EQ -biased (equi-biased) in several previous studies were revised with the intent of identifying the polysemous verbs in these lists and their overall verb biases (Garnsey et al., 1997; Hare et al., 2003, 2004; Jennings, Randall and Tyler, 1997; Kennison, 1999; Trueswell et al., 1993; Trueswell and Kim, 1998; and Wilson and Garnsey, 2009). Garnsey et al. (1997) determined the biases of 100 verbs in a norming study and coded the completions as direct objects, embedded sentential complements and other types of structures. Subsequently, Kennison (1999) documented the SF frequencies for 136 verbs which could co-occur with both NPs and SCs. She categorized the participants' sentence continuations as NP complements, tensed SCs, PP complements, infinitival complements and others. Verb bias information in Wilson and Garnsey (2009) and Jennings et al.'s (1997) studies was also based on norming studies including sentence completion tasks. In the former study, 40 verbs were included, while the latter tested 93 verbs. Similarly, Trueswell et al. (1993) tested 50 verbs in a preliminary normative study and determined their overall biases by categorizing them as SC, NP and Other completions. Another group of researchers, on the other hand, chose to analyze sample sentences extracted from various corpora. Trueswell and Kim (1998) used *Wall Street Journal* and *Brown Corpus* in order to classify the verbs as DO-prime and SC-prime verbs. In Hare et al.'s (2003) study, they extracted all sentences containing the 20 target verbs from the *Wall Street Journal* (WSJ), *Brown Corpus* (BC), *WSJ87/Brown Laboratory for Linguistic Information Processing* (BLLIP), and *Switchboard* (SWBD). In a subsequent study, Hare et al. (2004) selected 290 verbs and analyzed the sentences extracted from the *Wall Street Journal*, *Brown Corpus* and *WSJ87* by using some parse categories.

The findings of all these previous studies were evaluated based on Garnsey et. al.'s (1997) criteria for determining the overall verb biases. When the percentage of DO complements was twice the percentage of SC complements, the verb was labeled as DO-biased, and the reverse was true for SC-biased verbs. When the difference between the percentages of DO and SC complements did not exceed 15%, these verbs were categorized as equi-biased and the ones that did not meet any of these criteria were considered to have no bias. The overall subcategorization biases of the 20 target verbs identified in the previous studies and in the *Corpus of Contemporary American English* (COCA) are presented in Appendix-1.

In addition to the verbs selected from these lists, six other verbs having more than one sense in WordNet (Miller, Beckwith, Fellbaum, Gross, Miller, 1990) and which could be complemented by both SC and DO arguments were also chosen (*charge, dictate, hold, insert, resolve, urge*). All sentences containing these six verbs were extracted from the COCA, and the structures following these verbs were categorized as DO, SC and Other based on Hare et al.'s (2003) criteria presented in Table 3.1.

As for the sense-contingent biases of the verbs, the claim about the relationship between verb senses and their subcategorization preferences was grounded in the statistical information provided in the two studies having been carried out by Hare et al. (2003, 2004). An in-depth analysis of the DO and SC completions by sense in the three different corpora was done in these studies and the results related to 11 of the target verbs included in the present study are presented in Appendix-2.

Table 3.1. *Categorization of fine-grained parse categories*

Category	Parse	Example
Direct Object	*NP*	Neither **acknowledged** the gift.
	NP-NP	When Giffen decided to **charge him interest** ...
	NP-PP	The work **added** two beds to the hospital.
	NP-That-S	Jack would have **bet** his life that ...
	NP-Wh-S	They **accepted** it because ...
		He **held** the controls where they were.
	Perception Complement	I could **feel** the hair stand up.
Sentential Complement	*That-S*	The Russian experimenters **claim** that only a small....
	That-less-S	He **claimed** this was the favorite refrain.
Other	*NP-infin-S*	I **found** it to be March 15th.
	Infin-S, Infin-S-PP	The guerillas **admitted** to being a little bit tired.
	Wh-S	He **admits** what he does.
		The British government will **decide** whether to let..
	Verb-ing	He **agreed**, acknowledging that ...
	Nominal	They **admitted** to betting on the game.
	PP	We **add** to their burden...
	0	When he **charged**, Mickey was ready.
	Passive	Three students were **admitted**...
	Quote	Coombs has **declared**, "Two strong arms were..."

3.4. Pilot Study

Prior to the actual data collection phase, a pilot study was carried out in order to find out whether the participants at this proficiency level were familiar with the verbs selected and their DO-biased and SC-biased senses. This study was also expected to help evaluate the test material, form an idea about the ideal number of items in such an experiment and test the procedures to be followed during sentence completion tasks. The list of verbs selected for the pilot study, their DO-biased and SC-biased senses, sample sentences from bilingual dictionaries and the verbs used in the filler items are given in Appendix-3. The definitions and sample sentences provided in this part were taken from *Longman Dictionary of Contemporary of English, Cambridge Dictionary, and Oxford English Living Dictionaries.* Also, *A Valency Dictionary of English* was used. It is a corpus-based dictionary of verbal complementation patterns in English (Herbst et al., 2013).

3.4.1. Participants of the pilot study

The pilot study was conducted at Eskişehir Osmangazi University, Department of English Language Teaching, where the medium of instruction is English. 34 first-year and 30 third-year undergraduates participated in the study for course credit. Due to missing data (i.e. less than half of the fragments were completed), only 52 participants' data were available for analysis. The group was homogenous in terms of their ages, native languages and educational backgrounds. They were all native speakers of Turkish with an age range of 17-22 years. Also, they all reported that they started learning English when they were fourth graders at the age of 9-10. They had passed the national foreign language test as a part of the university entrance exam. They then took the ESOGÜ English Proficiency test. The students who passed it were accepted to their programs, whereas the ones who failed were required to complete the English preparatory school program successfully. The Common European Framework level achieved at the end of this program was B2 (Upper Intermediate/Independent User). Therefore, the students were considered to have gained a fairly high level of English proficiency.

3.4.2. Data collection instrument and procedure of the pilot study

A list including sentence fragments (e.g. *He resolved* _______) with 38 selected verbs was constructed for the pilot study (see Appendix-4). Of these 38 polysemous verbs piloted, 19 were used in Hare et al.'s (2003) study, 5 were taken from Trueswell et al.'s (1993) study and piloted by Uçkun (2012) with a group of Turkish university students and 14 were selected by the researcher. In parallel with the previous studies, WordNet (Miller, Beckwith, Fellbaum, Gross, Miller, 1990) was used to make sure that the 14 verbs added to the pilot study by the researcher have two distinct senses that favor DO or SC constructions. The material consisted of a total of 76 sentence fragments. 38 of these fragments included the verbs selected on the basis of a review of the related literature and corpus analyses, while the other 38 were only filler items that could be completed using various syntactic structures. In this way, test items did not follow one another. Each of the fragments included a pronominal subject and a verb in its past tense form.

The participants were given these 76 fragments and were requested simply to write down the first completion that came to their minds. They were given three practice trials prior to the study in order to clarify exactly what they were required to do. The completion of the entire task lasted approximately 50 minutes.

3.4.3. Data analysis procedure of the pilot study

The sentence continuations for each verb were hand-coded using Hare et al.'s (2003) criteria of fine-grained parse categories (Table 3.1 in section 3.3). The first step of coding was the determination of the verb sense (SC-biased vs. DO-biased sense) based on the overall meaning of a particular sentence. As a second step, for each verb sense, participants' continuations were categorized as SC, DO or *Other* arguments as in examples (1a)-(1d) and (2a)-(2e) below:

Recall

SC-sense (to remember a particular fact, event or situation from the past)

DO-sense (to ask people to return a product they have bought as there may be something wrong with it)

(1a) He recalled that they made pancakes together. *(SC-sense/ SC argument)*

(1b) He recalled the moments he lived when he was a kid. *(SC-sense/DO argument)*

(1c) He recalled where he left his keys. *(SC-sense/OTHER argument)*

(1d) He recalled me that I should go to school. *(Incorrect)*

Indicate

SC-sense (to say or do something to make your wishes, intentions, etc clear)

DO-sense (to point or show a person, direction, place or thing)

(2a) He indicated that he didn't want to call her but he had to. *(SC-sense/SC argument)*

(2b) He indicated the man and said something. *(DO-sense/DO argument)*

(2c) He indicated shortly how to go to the city center. *(SC-sense/OTHER argument)*

(2d) He indicated the seriousness of the issue. *(SC-sense/DO argument)*

(2e) He indicated to notes. *(Incorrect)*

Next, the numbers and percentages of sense-contingent SFs of the verbs as well as those of the incorrect completions and the items left blank were calculated. The verbs that would be used in the main experiments were selected based on the findings of the pilot study. The verbs were excluded from the main study when:

- the percentages of the correct completions were below 55%

- the participants avoided using or failed to use one of the target senses of a particular verb in their completions
- the researcher had difficulty in distinguishing between the two senses of the verbs in sentence completions.

3.4.4. Results of the pilot study

Subsequent to the hand-coding of the participants' completions, the verb sense and SF preferences in them were categorized as *SCS-SC* (sentential complement sense - sentential complement argument), *SCS-DO* (sentential complement sense - direct object argument), *SCS-Other* (sentential complement sense - other arguments), *DOS-DO* (direct object sense - direct object argument), *DOS-SC* (direct object sense - sentential complement argument), *DOS- Other* (direct object sense - other arguments), *Diff-Sense* (different sense), *Amb-Sense* (ambiguous sense), *INC* (incorrect use) and *NA* (no answer). The frequencies and percentages of sentence completions that fell into these categories were calculated, and the results are presented in Table 3.2.

In the verb selection phase, the percentages of incorrect completions and items left blank were added together and seven verbs for which the percentages of correct trials were below 55% were excluded from the study (*acknowledge, charge, dictate, hold, project, suggest* and *urge*). Also, most of the participants failed to use the DO-biased senses of some target verbs (*assume, deny, emphasize, figure, imply, predict* and *realize*) and the SC-biased senses of some others (*maintain* and *resolve*). Considering that these particular verb senses might occur rather infrequently and the participants might not have been exposed to them frequently enough, these nine verbs were not included in the study. Lastly, as the SC-biased and DO-biased senses of the verbs *announce* (SC-biased: to announce officially / DO-biased: to give the name of) and *believe* (SC-biased: to think something is true or possible / DO-biased: to credit with veracity, to accept as true) are too close to each other and it made the classification and analysis of the data rather difficult, they were also excluded from the study, leaving 20 verbs for the main study (*add, admit, anticipate, bet, claim, confirm, declare, feel, find, grasp, indicate, observe, recall, recognize, reflect, report, reveal, accept, establish* and *discover*).

Table 3.2. *Results of the pilot study (Percentages of sentence continuations in the predetermined categories for 38 polysemous verbs)*

NO	VERB	SCS-SC (%)	SCS-DO (%)	SCS-OTHER (%)	DOS-DO (%)	DOS-SC (%)	DOS-OTHER (%)	DIFFERENT SENSE (%)	INCORRECT (%)	NO ANSWER (%)
1	**accept*	17,3	9,6	-	44,2	-	-	-	26,9	1,9
2	*acknowledge*	19,2	17,3	3,8	3,8	-	-	-	28,8	26,9
3	**add*	21,1	-	-	75	-	-	-	1,9	1,9
4	**admit*	36,5	23	28,8	1,9	-	-	-	5,7	3,8
5	*announce*	59,6	17,3	-	11,5	-	-	-	7,6	3,8
6	**anticipate*	30,7	15,3	-	9,6	-	5,7	-	19,2	19,2
7	*assume*	69,2	-	-	-	-	-	-	3,8	26,9
8	*believe*	55,7	-	-	15,3	-	25	-	3,8	-
9	**bet*	48	-	-	5,7	-	7,6	-	26,9	11,5
10	*charge*	-	21,1	-	7,6	-	-	-	42,3	28,8
11	**claim*	76,9	-	15,3	1,9	-	-	-	-	5,7
12	**confirm*	44,2	11,5	7,6	19,2	-	-	-	7,6	9,6
13	**declare*	34,6	-	-	34,6	-	-	-	9,6	21,1
14	*deny*	28,8	23	23	-	-	-	-	13,4	11,5
15	*dictate*	11,5	21,1	-	15,3	-	-	-	15,3	36,5

Table 3.2. (Continued) *Results of the pilot study (Percentages of sentence continuations in the predetermined categories for 38 polysemous verbs)*

NO	VERB	SCS-SC (%)	SCS-DO (%)	SCS-OTHER (%)	DOS-DO (%)	DOS-SC (%)	DOS-OTHER (%)	DIFFERENT SENSE (%)	INCORRECT (%)	NO ANSWER (%)
16	**discover*	17,3	23	-	50	-	-	-	3,8	5,7
17	*emphasize*	28,8	42,3	3,8	9,6	-	-	-	7,6	7,6
18	**establish*	3,8	-	-	75	-	-	-	3,8	19,2
19	**feel*	3,8	-	-	-	-	-	92,3	-	3,8
20	*figure*	21,1	25	15,3	1,9	-	-	-	9,6	26,9
21	**find*	15,3	9,6	1,9	61,5	-	3,8	1,9	5,7	-
22	**grasp*	3,8	13,4	5,7	36,5	-	-	-	1,9	38,4
23	*hold*	-	5,7	-	40,3	-	-	-	26,9	26,9
24	*imply*	46,1	13,4	-	-	-	-	-	11,5	28,8
25	**indicate*	40,3	15,3	-	9,6	-	5,7	-	5,7	23
26	*maintain*	1,9	-	-	53,8	-	5,7	-	21,1	17,3
27	**observe*	21,1	1,9	-	71,1	-	-	-	1,9	3,8
28	*predict*	38,4	48	-	-	-	-	-	3,8	9,6
29	*project*	1,9	-	-	30,7	-	-	-	17,3	50
30	*realize*	84,6	7,6	-	1,9	-	-	-	3,8	1,9

Table 3.2. (Continued) *Results of the pilot study (Percentages of sentence continuations in the predetermined categories for 38 polysemous verbs)*

NO	VERB	SCS-SC (%)	SCS-DO (%)	SCS-OTHER (%)	DOS-DO (%)	DOS-SC (%)	DOS-OTHER (%)	DIFFERENT SENSE (%)	INCORRECT (%)	NO ANSWER (%)
31	**recall*	7,6	42,3	7,6	13,4	-	-	-	17,3	11,5
32	**recognize*	30,7	7,6	-	46,1	-	-	-	7,6	7,6
33	*resolve*	1,9	-	1,9	55,7	-	-	-	5,7	34,6
34	**reveal*	17,3	44,2	-	9,6	-	-	-	11,5	17,3
35	**reflect*	3,8	1,9	3,8	38,4	-	1,9	11,5	13,4	25
36	**report*	42,3	9,6	-	23	-	-	9,6	11,5	3,8
37	*suggest*	28,8	9,6	9,6	-	-	-	-	42,3	9,6
38	*urge*	-	19,2	-	-	-	-	-	25	55,7

Note: *As individual items are rounded, percentages may not sum to 100%*
** is used for the target verbs that are included in the main experiments*

3.5. A Small-Scale Corpus Testing

A small-scale corpus testing was primarily done so as to verify the probabilistic relationship between verb senses and their subcategorization preferences. For the determination of the overall verb biases irrespective of verb senses, 40 sentences including each of these verbs were randomly extracted from the COCA and their subcategorization biases were determined based on the classification in Table 3.1 presented in Section 3.3. Similarly, in the identification of the sense-contingent biases of verbs, 40 sentences with the SC-biased sense and 40 sentences with the DO-biased sense of each individual verb were extracted from the COCA and the continuations were analyzed using the same criteria presented above. The COCA, which is a freely-available corpus of American English, is reported to contain more than 1 billion words of text and to include an equal distribution of words from a wide range of genres such as spoken, fiction, newspapers and academic texts. Thus, the samples extracted from it represent different kinds of usage in various text types.

3.5.1. Results of the corpus testing

As the consistency between Hare et al.'s (2003, 2004) results of the multiple corpora analyses and those of the present study would back up the claim regarding the sense and SF relationship, it would provide a solid base for the current research. As stated before, the findings of the previous studies in terms of the overall biases of the target verbs can be found in Appendix-1. Also, the findings of Hare et al. (2003,2004) concerning the overall biases of the polysemous verbs included in the present study are partially presented in Appendices 5 and 6.

The analysis of the structural biases of the verbs in the COCA revealed that 14 out of 20 target verbs were DO-biased, 5 were SC-biased and only 1 of them was EQ-biased. The mean percentages of DO structures following these 20 verbs were 52%, whereas that of SCs were 27%. Moreover, the percentage of the structures that did not fall into either one of these categories was 21%. Subcategorization probabilities for each individual verb are presented in Table 3.3. Although these findings were, by and large, consistent with those of previous corpora analyses, they also indicated that the overall subcategorization probabilities of verbs differ across corpora (Roland and Jurafsky, 1998; Roland et al., 2000; Hare et al., 2003; 2004).

Table 3.3. *Numbers and percentages of SC, DO and Other structures in the COCA (Overall subcategorization biases)*

VERB	SC		DO		OTHER		VERB BIAS	VERB	SC		DO		OTHER		VERB BIAS
	N (out of 40)	%	N (out of 40)	%	N (out of 40)	%			N (out of 40)	%	N (out of 40)	%	N (out of 40)	%	
accept	3	7,5	31	77,5	6	15	DO-BIAS	**feel**	15	37,5	3	7,5	22	55	SC-BIAS
add	11	27,5	23	57,5	6	15	DO-BIAS	**find**	7	17,5	28	70	5	12,5	DO-BIAS
admit	21	52,5	9	22,5	10	25	SC-BIAS	**grasp**	2	5	33	82,5	5	12,5	DO-BIAS
anticipate	6	15	24	60	10	25	DO-BIAS	**indicate**	28	70	8	20	4	10	SC-BIAS
bet	24	60	4	10	12	30	SC-BIAS	**observe**	5	12,5	34	85	1	2,5	DO-BIAS
claim	23	57,5	8	20	9	22,5	SC-BIAS	**recall**	4	10	23	57,5	13	32,5	DO-BIAS
confirm	13	32,5	22	55	5	12,5	DO-BIAS	**recognize**	5	12,5	23	57,5	12	30	DO-BIAS
declare	11	27,5	23	57,5	6	15	DO-BIAS	**reflect**	2	5	25	62,5	13	32,5	DO-BIAS
discover	5	12,5	28	70	7	17,5	DO-BIAS	**report**	8	20	24	60	8	20	DO-BIAS
establish	4	10	28	70	8	20	DO-BIAS	**reveal**	17	42,5	19	47,5	4	10	EQ-BIAS

	SC Arguments %	DO Arguments %	OTHER Arguments %
MEAN %	26,75	52,5	20,75

The second phase of the corpus analysis aimed to investigate whether sense-contingent biases of the target verbs differed from their overall biases. To this end, the results of Hare et al.'s (2003) corpus analyses were accepted as the baseline. They reported using WordNet's Semantic Concordance including a subset of the Brown Corpus in extracting the sentences with the identified verb senses. Their results concerning the sense-contingent subcategorization biases of 12 verbs are provided in Appendix-7.

In the current study, as in the first step, the corpus testing aimed to find out whether the same pattern would be observed in the sentences that appeared in another corpus. The senses and SFs of the verbs in 40 sentences with each distinct sense (DO-biased and SC-biased) of the target verbs were examined and hand-coded as SC, DO and *Other* arguments.

In parallel with the findings of Hare et al. (2003, 2004), the results presented in Table 3.4 suggest that both SC and DO continuations were observed in the sentences extracted. However, the majority of the sentences with SC-biased senses are followed by SC structures, and more DO structures were observed as continuations for sentences in which the verbs were used in their DO- biased senses. This indicated that along with some other possible factors, verb sense has a noticeable effect on the SFs verbs select, confirming the findings of Hare et al., 2003, 2004, and Roland and Jurafsky, 2002. Since the present study is mainly based on this argument, the data collection instruments used in the main experiments aimed to activate the sense-contingent subcategorization biases of the target verbs.

Table 3.4. *Numbers and Percentages of SC, DO and Other structures in the COCA (sense-contingent subcategorization biases for the 20 polysemous verbs included in the study)*

	SC-SENSE						DO-SENSE					
VERB	**SC**		**DO**		**OTHER**		**SC**		**DO**		**OTHER**	
	N out of 40	**%**	**N out of 40**	**%**	**N out of 40**	**%**	**N out of 40**	**%**	**N out of 40**	**%**	**N out of 40**	**%**
accept	13	32,5	26	65	1	2,5	-	-	38	100	2	5
add	38	95	-	-	2	5	-	-	34	85	6	15
admit	22	55	13	32,5	5	12,5	-	-	40	100	-	-
anticipate	7	17,5	22	55	11	27,5	-	-	40	100	-	-
bet	38	95	2	5	-	-	-	-	19	47,5	21	52,5
claim	30	75	-	-	10	25	-	-	38	95	2	5
confirm	13	32,5	24	60	3	7,5	4	10	36	90	-	-
declare	23	57,5	7	17,5	10	25	-	-	40	100	-	-
discover	27	67,5	7	17,5	6	15	-	-	39	97,5	1	2,5
establish	27	67,5	-	-	13	32,5	-	-	40	100	-	-
feel	36	90	-	-	4	10	-	-	30	75	10	25
find	33	82,5	4	10	3	7,5	-	-	39	97,5	1	2,5
grasp	11	27,5	26	65	3	7,5	-	-	36	90	4	10
indicate	24	60	13	32,5	3	7,5	-	-	40	100	-	-
observe	27	67,5	13	32,5	-	-	-	-	31	77,5	9	22,5
recall	11	27,5	18	45	11	27,5	-	-	40	100	-	-
recognize	22	55	14	35	4	10	-	-	40	100	-	-
reflect	19	47,5	-	-	21	52,5	4	10	32	80	4	10
report	12	30	20	50	8	20	6	15	31	77,5	3	7,5
reveal	14	35	18	45	8	20	-	-	38	95	2	5

CONDITION	**SUBCATEGORIZATION TYPE**					
	SC N (out of 800)	**SC %**	**DO N (out of 800)**	**DO %**	**OTHER N (out of 800)**	**OTHER %**
SC-BIASED SENSE	447	*55,87*	227	*28,37*	126	*15,75*
DO-BIASED SENSE	14	1,75	721	90,12	65	8,12

3.6. Experiment 1: The Use of Sense-Contingent Subcategorization Frame Information in the Absence of Biasing Contexts

The primary goal of this experiment was to examine the participants' sentence completion preferences which were not influenced by the presence of preceding contexts. In this way, participants' tendencies to use the specific verb senses and associated SFs out of context were revealed. This indicated the extent to which the participants could make use of their knowledge about the relationship between verb sense and SFs. Moreover, the preferences of L2 speakers were compared to those of L1 speakers of English, shedding more light on the possible differences/similarities in their language production processes in the absence of biasing contexts.

3.6.1. Participants of experiment 1

Two separate groups of participants took part in this experiment. The L2 English speaker group included a total of 108 second-year undergraduates (47 males and 61 females) majoring in the department of English Language Teaching at Anadolu University. The participants were chosen on a voluntary basis and they were all native speakers of Turkish in the 18-22 age range. As for their educational backgrounds, these individuals were first exposed to English as a foreign language in a formal learning setting in their elementary school years when they were around 8-10 years old or later, so they were defined as *late L2 learners* (van Hell and Tokowicz, 2010). They had been accepted to this English-medium undergraduate program after achieving a specified score in the National University Entrance Exam, which had a sub-test of English as a foreign language. After they had registered in the program, they were required to either pass the English Proficiency Test offered by Anadolu University School of Foreign Languages or to complete the intensive English preparatory school program successfully. All of the students who completed at least one of these two stages demonstrated English proficiency at the intermediate level (B1 or B2). Those who graduate from this 4-year-program are granted the bachelor's degree and can serve as English teachers.

These participants in the L2 group were given the Oxford Placement Test in order to ensure the within-group homogeneity and to determine the exact number of participants that will take part in the experiment. The second version of the standardized quick placement test by *Oxford University Press and University of Cambridge Local*

Examinations Syndicate was administered. This 30-minute, paper and pen test does not assess the listening, speaking and writing skills of the participants. It was chosen for the current study on the grounds that the materials designed for this study primarily required improved grammar knowledge and reading skills. The results of the test revealed that of the 108 students, 5 were elementary, 37 were low-intermediate, 55 were upper-intermediate and 11 were advanced level students. Because students with elementary and advanced-level English proficiency did not meet the language proficiency requirements of the current research, they were excluded from the study, thus leaving 92 L2-English participants for the first experiment. However, only 85 participants' data were available for analysis (32 low-intermediate and 53 upper-intermediate) due to some errors and missing data (the scores of the students and the band scale used in assessment are provided in Appendix-8).

The second group of participants consisted of 40 L1 speakers of English and the data from these participants were gathered online via Amazon Mechanical Turk (MTurk), which was essentially developed as a marketplace for work in which human intelligence is needed. The participants were sent a link to the experiment on Ibex website, which provides free hosting for online experiments. These 40 L1 speakers who provided data for this part of the study participated in this experiment for pay. In brief, the total number of participants whose data were available for analysis in Experiment 1 was 125 (85 L2 learners and 40 L1 speakers of English).

3.6.2. Data collection instrument and procedure of experiment 1

The list that was used in the pilot study and that included sentence fragments with 38 target verbs and 38 fillers was revised based on the findings of the pilot study. The number of the target verbs was reduced to 20 and the number of the filler items was increased to 50 for the reasons explained in Section 3.4.4. The data collection tool included instructions about what the participants were supposed to do and a total of 70 sentence completion fragments. As in the pilot study, each one of the fragments included the pronominal subject *he* and the past tense form of the target verb. The verbs in the 20 of the filler items were SC-biased, while the other 20 tended to be mostly followed by DO continuations. The whole set of fragments used in Experiment 1 are provided in Appendix-9.

After the administration of the placement test to select the participants, the data were collected by the researcher during the scheduled class time and the participants were given approximately 35 minutes to complete the sentence fragments. Before they started performing the task, they were informed about the general outline and the overall purposes of the research. They approved their voluntary participation by signing the consent form provided in Appendix-10. Ethics approval for the three experiments that would be conducted was also obtained from Anadolu University Ethics Committee prior to all these treatments (Appendix-11).

L1 speakers of English who took part in this experiment were also administered the same sentence completion task online. They were first provided with some written information about the purpose of the study, procedures, confidentiality, contact details, withdrawal of participation and terms of consent. After they read the instructions and consented to participate, they were asked to complete a short questionnaire about their linguistic background. Next, they were provided with some instructions informing them about what kind of a task they were expected to carry out. Following three practice items, they started to complete the fragments.

3.6.3. Data analysis procedure of experiment 1

As in the pilot study, two steps were followed in the classification of the data collected. First, the participants' completion norms in the absence of biasing contexts were identified by both judging the verb senses in their sentences (SC or DO-biased sense) and categorizing the syntactic structures in their continuations as DOs, SCs or *Other* arguments. In addition to the fine-grained, sense-contingent classification of the data, separate categories were formed for incorrect sentences (INC), items left blank (NA), and completions in which the intended verb sense is ambiguous (AMB-S) or different (DIF-S) from the two target senses determined beforehand. The categories used in the examination of the participants' verb sense and SF preferences are also explained in some detail in Section 3.4.4. In this experiment, both the numbers and percentages of completions with the two different senses of each verb and the sense-contingent SF preferences were calculated.

After the identification of the categories which the participants' completions belonged to, the numbers and percentages of preferred verb senses and SFs were compared within the *groups* and *experiments* by employing hierarchical log-linear modeling. Partial chi-square tests were also performed as follow-up analyses. The results of these inferential statistics will be presented in Section 4.4, in which the findings of Experiment 1 and Experiment 2 are compared.

3.7. Experiment 2: The Use of Sense-Contingent Subcategorization Frame Information in the Presence of Biasing Contexts and their Comparison with Experiment 1

This experiment was primarily designed in order to explore the possible effects of biasing contexts on L1 and L2 English speakers' use of verb subcategorization information in language production. The purpose of this experiment was four-fold:

(i) whether discourse context has an influence on promoting the intended senses of the target verbs

(ii) whether the promoted senses of the verbs retrieve the associated, sense-contingent SFs

(iii) whether/to what extent L1 and L2 speakers differ in making use of sense-contingent verb subcategorization information in the presence of biasing contexts

(iv) whether the participant groups' use of sense-contingent SFs differ in the absence and presence of biasing contexts

3.7.1. Participants of experiment 2

As in Experiment 1, two groups of English speakers (L1 and L2) participated in this experiment. The L2 speaker group consisted of 119 second-year undergraduate students studying in the department of Foreign Language Education at Anadolu University. The data were collected from this group of participants after a two-week- interval with the first experiment. They all participated in the study on a voluntary basis. Of the 119 volunteers who were administered the sentence completion task, 11 participants were excluded from the study either because their English proficiency levels did not meet the criteria or their data were incomplete. Thus, data from only 108 L2 speakers of English (43 low-intermediate and 65 upper-intermediate) were available for analysis, 54 per list (section 3.7.2.1 provides some details about these lists). Seventy-nine of these students reported having participated in the first experiment. The remaining 40 participants were also given the placement test after the experiment. Data gathered from 9 students were not used for analysis because four students refused to take the placement test, three were found to be advanced-level and two of them were elementary level students. All the information regarding the age range, linguistic and educational backgrounds of the participants of the first experiment applies to the ones in the second experiment.

In order to provide the L1 data for this experiment, 40 L1 speakers of English who had online access to the materials on Amazon Mechanical Turk (MTurk) took part in this part of the study for pay. Thus, data for the present experiment looking into the influence of discourse context information on the use of sense-contingent SFs were gathered from a total of 148 participants.

3.7.2. Data collection instrument and procedure of experiment 2

As the main purpose of this experiment was to reveal the effect of discourse context on the activation of intended verb senses and SFs, one-sentence contexts preceding the sentences that contained the target polysemous verbs were added to the sentence fragments constructed for the first experiment. Before proceeding further, the definition of context and discourse context as well as the justification of using discourse context are in order.

3.7.2.1. *Context and discourse context*

Speakers do not speak and interpret utterances in a vacuum, but rather in a context, be it situational, cultural, and linguistic context. For example, speakers interpret deictic expressions such as personal pronouns, temporal, and spatial deictic expressions when they know the particular interlocutors, as well as the specific time, and place of the utterance. In pronoun resolution, pronouns are recovered mostly from the antecedents that take place in the preceding discourse. Taking all these into consideration, context can be defined as the physical environment in which a discourse occurs. Linguistic context, which is of primary importance in Experiment 2, is the context within the discourse and the interplay between the different parts of a sentence/text (i.e. words, phrases, sentences, paragraphs). It is essential in clarifying the exact meanings of words and sentences. Context helps to eliminate lexical and structural ambiguity, indicate referents and detect conversational implicature, all of which facilitate the interpretation of what is being said or read (Song, 2010).

The roles and interaction of many semantic factors in authentic communication require a context-dependent study of discourse. Discourse context can be considered to be the utterances in the surrounding, either preceding or subsequent utterances. In this study, the term context pertains to the sentence preceding the target sentence. Considering the significance of context and discourse context in the comprehension of both written and spoken language, the participants of the present study were provided with biasing contexts because the main aim was to activate some particular verb senses so as to investigate whether they would retrieve the sense-contingent SFs.

To this end, a pair of context sentences for each one of the 20 polysemous verbs were constructed by the researcher, who was inspired by the sample sentences in online dictionaries (*Longman Dictionary of Contemporary of English, Cambridge Dictionary* and *Oxford English Living Dictionaries*), the *COCA* and Hare et al.'s (2003) studies. In each pair, one of the context sentences aimed to bias the participants towards the DO-sense of the target verb, whereas the other towards the SC-sense. The context sentences were followed by sentence fragments identical to the ones used in Experiment 1. They all included a subject pronoun that referred to an entity in the preceding context sentence and the past tense form of the target verb. The total number of items constructed for this experiment was 80 (40 target items and 40 fillers). In 36 of the sentences, the sentence fragments included conjunctions such as *thus, however*, *so, finally* and *then*, and 8 sentences included adverbs like *really, still, eagerly*, and *obviously* so as to ensure cohesion between the context and the target sentences. While the past simple forms of the verbs were used in the majority of the sentences, two target sentences were written in the past perfect tense. In order not to prime the SC structure in some cases, no sentential clauses were included in the context sentences. However, the use of direct objects could not be avoided owing to their prevalence in the language. In addition, the sentence pairs constructed were of similar length. Below is a sample sentence pair for the verb *establish*:

DO-biasing context (sense: to start a company, organization, etc. that is intended to exist for a long time, to found):

(1a) William produced a series of crime novels which were aimed towards black audiences, but he failed to find a supportive publishing company. He thus established ______________________.

SC-biasing context (sense: to find out facts that will prove that something is true):

(1b) Max examined the previous research on the long-term effects of divorce and conducted a comprehensive study with 1500 participants. He thus established ____________________.

As one SC-sense promoting and one DO-sense promoting context sentence were created for each polysemous verb, two different versions of the material were used. In this way, it was ensured that each verb would be seen by each participant in one particular context. Therefore, half of the verbs in each participant's list were preceded by DO-sense biasing contexts while the other half by SC-sense biasing ones. As a result of all these arrangements, each version of these lists included 20 sentences with target verbs and 40 filler items that can be followed by various syntactic structures. The complete versions of two sentence completion tests are provided in Appendix-12. The tests items were revised and corrected based on the feedback provided by 10 low-intermediate level ELT preparatory school students and expert opinion in order to make sure the context sentences were comprehensible and served the purpose of activating the targeted senses and structures.

The first set of data were collected from L2 speakers of English within the school context after they were informed about the research topic and task type. The participants who had not participated in the first experiment were also asked to sign the consent form. The students were then asked to read the context sentences and complete the following fragments. The task lasted approximately 60 minutes.

For the collection of the data from L1 English speakers, two lists were combined and administered as a single list for practical reasons. It included 40 sets of sentences including the target verbs and 40 filler items. It was assumed that the collection of the data on an online platform would prevent the participants from seeing the previous items after they have clicked on the *next* button. Further, the sufficient number of filler items would eliminate the possibility that they could remember the target items. After reading the information about the study, consenting to participate and filling out the linguistic background questionnaire, they completed the fragments preceded by context sentences.

3.7.3. Data analysis procedure of experiment 2

As the biasing contexts specifically created for Experiment 2 were expected to affect participants' use of the intended senses of polysemous verbs, the first phase of the data analysis included the classification of the verb senses in participants' completions as SC-biased or DO-biased. It was simply done based on the overall meanings of the sentence continuations as in the pilot study and the first experiment. The second underlying assumption in this experiment was that participants would produce the SFs associated with the verb senses they adopted in their completions. To this end, their continuations were categorized as SC, DO or *Other* arguments based on the predetermined criteria. The comparison of these results with those of the first experiment also revealed the effect of biasing contexts on the promotion of the intended verb senses and SFs. In addition, a comparison of L1 and L2 speaker findings was drawn so as to find out whether they differed in their use of verb bias information when they were provided with discourse context information.

The empirical data gathered were first converted to binary data, which is a type of categorical data taking only two distinct values coded as 0 and 1 numerically. In categorical (frequency) data, the observed numbers and percentages for each value of a variable in each cell are counted (Howell, 2010). In the present experiment, participants' preferences as to the verb senses and SF types were coded as 1 if they had chosen the corresponding sense/structure and 0 if another verb sense/SF had been preferred. In the comparison of L1 and L2 speakers' preferences, the frequencies and ratios were used. Also, in the analysis of the categorical binary data, relational contingency tables (RCT) were created. These tables, also called cross-tabulations, show the frequency distributions of the variables of interest and provide a snapshot of the data so that it will be easier to notice the salient patterns. They are commonly used for determining the relationships (interactions) between the categorical variables (Agresti, 1990). Further explanations and sample cross-tabulations will be provided in the subsequent parts of this section.

Prior to the use of statistical techniques and tools, participants' verb sense and SF preferences were examined using the categories explained in Section 3.4.4. The frequencies of constructions that belonged to those pre-determined categories were then regrouped and represented in the form of contingency tables to be used in data analyses. The analyses of the data collected in Experiments 1 and 2 were conducted by using IBM SPSS 25.0 Statistical Package (Statistical Package for Social Sciences).

The first two research questions, which concerned the effects of *group* (depending on participants' native languages) and *experiment* (the presence/absence of biasing contexts) on the preferred verb senses and SFs, were primarily addressed using hierarchical log-linear analysis. This model was employed for the purpose of looking into the possible relationships between these categorical variables in question. In essence, a log-linear model is usually defined as a multiple linear regression model "in which the classification variables (and their interaction terms) are the independent (predictor) variables, and the dependent variable is the natural algorithm of the frequency of cases in a cell of the frequency tables" (Anolli, Zurloni and Riva, 2006, p. 245). It thus enables higher-order associations between two or more categorical variables to be assessed, which two-variable chi-square analysis fails to achieve.

In the present study, 2x2x2 multi-way contingency tables with three variables, each with two levels were used. Table 3.5 provides a sample for the use of DO-biased verb senses only. The search for the most appropriate model started with the testing of the saturated model including all higher and lower-order relationships. Then, higher-order associations were eliminated from the model one by one until the goodness-of-fit statistics indicated that the fit between the model and the data was distorted.

Table 3.5. *A sample of a 2X2X2 contingency table*

GROUP	*SC-BIASED SENSE*	*BIASING CONTEXT*	
		absent	***present***
L1 Speakers	Preferred	352	759
	not preferred	448	41
L2 Speakers	Preferred	869	844
	not preferred	1111	236

There are several reasons why hierarchical log-linear procedure was the most favorable one to analyze the datasets in the current study. To begin with, this advanced technique allows for simultaneous consideration of two or more categorical variables (Kennedy, 1983) and it enables researchers "to conduct inferential tests of associations in contingency tables because the model can handle more complicated situations" (Azen and Walker, 2011, p. 137). In addition to the categorical nature of the frequency data collected, a log-linear model seems to be a good fit in this case since its use is not restricted to two or three-way tables. In other words, investigating the cell probabilities of categorical data, it "measures and tests the complex interactions arising in multidimensional tables" (Reynolds, 1977, p. 57). This makes it the most convenient statistical analysis method permitting a simultaneous observation of the main effects, two-way and three-way relationships that needed to be detected in this study. For all these reasons, log-linear modeling was employed to estimate the existence and strength of the associations among the use of SC and DO-biased verb senses & sense-contingent SFs, the groups formed on the basis of participants' native languages and the absence/presence of the contexts promoting the intended verb senses. In the comparison of the findings from Experiment 1 and Experiment 2, separate hierarchical log linear analyses were performed on the SC-biased and DO-biased verb sense data in order to test the main effects as well as the overall pattern of interactions within each verb-sense category.

Following the application of the log-linear procedure, partial Pearson Chi-square analyses were conducted separately because multiple comparisons were needed to determine exactly which levels differed. Chi-square (X^2) test for independence explores whether the categorical variables in 2*2 or r*c contingency tables are related or not. The result obtained indicates the degree of difference between the observed counts in a study and the counts that would be expected in the absence of a relationship in the population. The smaller the chi-square test statistics, the better the fit between the observed and expected counts; thereby, showing a high correlation between them. This suggests the existence of a relationship between the two variables in question. The significance of the dependency relationship between variables are then evaluated based on the predetermined alpha level of significance, which is usually $p < 0.05$ or $p < 0.01$.

3.8. Experiment 3: The Use of Discourse Context and Sense-Contingent Subcategorization Information in the Resolution of Temporary SC/DO Ambiguity

The findings of the corpus analyses and the two experiments carried out suggest that verb sense determines the subcategorization probabilities of the target verbs included in this study to a large extent. Moreover, in Experiment 2, discourse context information has been found to promote the intended verb senses, which is expected to activate their associated SFs, too. Finally, some differences between the sense and SF preferences of L1 and L2 speakers were observed in language production data. Based on these conclusions, the second stage of the current research aims to find out whether these information sources (sense-contingent verb subcategorization and discourse context information) are at work during real-time sentence processing. It also aims to shed light on whether L1 and L2 speakers make use of these information sources in the same way or they utilize totally different parsing strategies. To this end, an eye-tracking experiment was conducted with L1 and L2 English speakers as participants. The topic which was primarily dealt with in this experiment was SC/DO ambiguity resolution on the grounds that it is relatively easy to manipulate verb bias information in sentences including polysemous verbs and SC/DO ambiguity. Lastly, the scarcity of research centered upon sense-contingent verb subcategorization and the resolution of this particular type of ambiguity is considered to add to the significance of the current research. As particular verb senses are usually overlooked in most of the studies into the role of verb bias information in sentence processing, this experiment is one of the few studies looking into this semantic aspect of the issue.

3.8.1. Participants of experiment 3

As in the previous two main experiments, the convenience sampling method was adopted in selecting the sample in the present research, and the basic criterion in the recruitment of participants was their L1s as well as their availability to the researcher. Two different groups of participants took part in this experiment: upper-intermediate and advanced-level Turkish third-year EFL undergraduates studying at Middle East Technical University (METU) and English-speaking undergraduate students studying at the University of Massachusetts, Amherst (UMASS).

The data for the eye-tracking experiment were collected from a total of 123 participants (seventy-three L1 speakers of English and fifty L2 English speakers with Turkish L1 background). L1 English-speaking undergraduates from the UMASS were granted course credit for participation. Seven of these participants exceeded the pre-established criterion of 33% loss of trials due to track loss or blink, so their data were removed from the final dataset. In addition, three more participants were excluded from the study due to an excessively high error rate (more than 30%) in comprehension questions, leaving 63 participants in the data analysis. The average percentage of the correct answers to the comprehension questions following the experimental items was 87%. All of the participants were speakers of English as a first language with normal or corrected-to-normal vision (using glasses or contact lenses) and naive to the purpose of the study. The participants were required to complete a short prescreen survey before they signed up for the study. The questionnaire included background and demographic questions regarding their age, gender, native language(s), major, class level, the state where they were grown up, their vision and contact information. They also signed consent forms for participating in the current research study (Appendix-13).

As for the fifty L2 speakers, three were dropped for calibration problems and there was a 22,5% data loss in one of the participants due to technical difficulties. As a result, data from a total of forty-seven L2 English speakers were available for analysis. The average percentage of correct answers to the comprehension questions following the experimental items was 93%. The participants were third and fourth grade undergraduate students studying in the Department of Foreign Language Education at METU. They were native speakers of Turkish aged between 20 and 24. Their English proficiency levels as determined by the quick placement test (Oxford Placement Test) ranged between upper-intermediate and advanced levels. All of them reported having normal or corrected-to-normal vision. They were also administered a short background and demographic survey before participating in the experiment. They participated in the study for pay. Prior to the experiment, they were asked to read and sign the consent form in Appendix-14.

3.8.2. Data collection instrument and procedure of experiment 3

The stimuli for this eye-tracking experiment were constructed mostly based on the criteria presented in Hare et al.'s (2003) moving window self-paced reading study. The context and target sentences differed from those of Hare et al. (2003) in that the verbs used in these studies were somewhat different, and syntactically and lexically simpler sentences were needed in order to make sure that L2 speakers would read and understand them with ease. Thus, the stimuli consisting of 20 English polysemous verbs were created making use of sample sentences from corpora and online English dictionaries mentioned in Experiments 1 and 2. The stimulus set as a whole was comprised of target verbs, pairs of context sentences intended for the promotion of both verb senses (SC-biasing and DO-biasing contexts) and unambiguous control sentences in which the main verbs were followed by the complementizer *that*. The polysemous verbs were followed by SC-continuations in all target sentences and all these continuations were plausible for both SC-biasing and DO-biasing contexts. In this way, readers' expectations about DO continuations following DO-sense biasing contexts were violated. A sample set of items is presented in Table 3.6 below and the complete set of stimuli is given in Appendix-15.

Table 3.6. *The sample set of stimuli for the verb DISCOVER*

Verb: DISCOVER	
DO-sense:	to find someone or something, either by accident or because you were looking for them
DO-sense biasing context:	A team of scientists had been looking for Earth-like, habitable planets that harbor water in the universe.
Target sentence:	They discovered a planet must also have a substantial atmosphere and a reasonable spinning rate.
Unambiguous control sentence:	They discovered that a planet must also have a substantial atmosphere and a reasonable spinning rate.
SC-sense:	to find out something that you didn't know about before
SC-sense biasing context:	Students of the astrology class were surprised to find differences between planets in astrology and astronomy.
Target sentence:	They discovered a planet must also have specific traits representing the will of gods in astrology.
Unambiguous control sentence:	They discovered that a planet must also have specific traits representing the will of gods in astrology.

As to the properties of the stimuli, each context sentence primarily aimed at promoting a particular sense of the target verb and retrieving the associated SF. The target sentence following this context sentence included a subject pronoun referring to an entity in the preceding context, the target verb and an SC containing a noun phrase which could serve both as a sensible DO of the main verb and a subject in the sentential complement following the target verb. Also, the target sentence pairs constructed for four of the target verbs contained conjunctions such as *but* and *then* as well as the adverbial *just*. These optional conjunctions, noun phrases and target verbs were followed by two to six-word disambiguation regions. Of the 20 sets of target sentences constructed for 20 polysemous verbs, ten included auxiliary or copula verbs following the subject of the SC, five included modal verbs and the remaining five included main verbs as the first words in their disambiguation regions. Subjects, optional adverbials, target verbs, noun phrases serving as the subjects of SCs and the disambiguation regions in all pairs of target sentences were identical but they varied in the remaining parts so that they would be plausible continuations in both SC-biasing and DO-biasing contexts. The stimuli were then arranged into two different lists by rotating items around the context and ambiguity variables, with each list containing 40 biasing context and target sentence pairs. Therefore, participants read both SC-biasing and DO-biasing contexts, but they encountered the ambiguous version with one context and the unambiguous one with the other context type. In this way, it was ensured that each four conditions of each item (SC-biasing/ambiguous, SC-biasing/unambiguous, DO-biasing/ambiguous, DO-biasing/

unambiguous) were read by an equal number of participants. As in Experiment 2, none of the context sentences or practice items included the target verbs or SC structures.

In the present experiment, the 80 items constructed for the present study were randomly intermixed with 146 other items. Six of them were only practice items, whereas the remaining 140 were fillers with varying syntactic structures. These filler items were rotated across different lists and they were discarded from the data at the analysis stage. Comprehension questions with two choices were also designed for each trial so that the reader was required to understand the context and the target sentences.

As for the data collection procedures, the first step for all researchers working in human subject laboratories and involved with human subject research was to fulfill the requirement of completing an online module called "CITI IRB Human Subjects Training Module". Therefore, the researcher completed "Group 2 Social and Behavioral Research Investigators and Key Personnel" module prior to the study. Then, the study was listed on the SONA Research Participation System, which was used by the faculty members of the Department of Psychological and Brain Sciences at the UMASS Amherst in data collection for their studies. The total period of data collection continued throughout the spring semester of 2017-2018 academic year. On the other hand, data from L2 speakers of English were gathered with ethical approval obtained from Anadolu University Ethics Committee and with the approval of the head of the Department of Foreign Language Education at METU. The L2 speaker data were collected during the fall semester of 2018 and spring semester of 2019.

In order to track the eye movements of L1 speakers, the eye-tracking laboratory in the Psychological and Brain Sciences Department of UMASS Amherst was used, while data from L2 speakers were collected in the eye-tracking laboratory of METU Foreign Language Education Department.

Both groups of participants' eye movements were recorded using an EyeLink 1000 (SR Research, Toronto, ON, Canada) eye-tracker, interfaced with a PC computer. The sampling rate was 1000 Hz. and the PC displayed the items constructed for the study on a screen from a distance of 55 cm. At this distance, the angular resolution of the eye-tracker was 10-30 min of arc, which corresponds to less than one character. Participants' eye locations were monitored every millisecond by the tracker and the sequence, start and finish times of their fixations were established by the software used. Only the movements of the right eye were recorded, and each participant was run individually. The stimuli were organized in a way compatible with the eye-tracking device used in this experiment and displayed on two separate lines in 11-point Monaco font, with two spaces between the lines.

Before the experiment began, the participants were informed about the procedure and the eye-tracker. Next, a nine-point calibration procedure was initially performed, and re-calibrations occurred between trials when needed. Then the participants started the experiment with a brief, unannounced practice block so that they would become familiar with the procedure. Each trial consisted of a context sentence and a target sentence presented on the computer screen simultaneously. The items were presented in a random order and the data collection process lasted approximately 45 minutes in each individual session.

After the data collection session ended, a debriefing form was given to each participant to provide them with some information about the aim of the research and any kind of manipulation the researcher may have used in constructing the stimuli (Appendix-16 for UMASS students and Appendix 17-for METU students). In this way, the participants were given the right to choose whether to include their data in the study or to have it destroyed.

3.8.3. Data analysis procedure of experiment 3

In the data analysis process, similar procedures were followed so as to make two datasets gathered from L1 and L2 English speakers ready for statistical analyses. SR Research EyeLink 1000 system was used and EyeTrack 7.10m presentation software provided the eye-tracking data (Stracuzzi and Kinsey, 2009; also see https://blogs.umass.edu/eyelab/software/). Prior to the analysis of the data, a manual drift correction was performed on every trial to adjust the recorded fixation locations. This was required either because of the declined calibration accuracy throughout the experiment or the lack of a perfect match between the recorded and the actual fixated locations. Then, standard reading time measures were computed for each region by the software.

Generalized linear mixed-effects models (GLMM) were used to perform the analyses on the reading time data gathered. In these models, subjects and items were specified as crossed random intercepts (Baayen, Davidson and Bates, 2008). There are several reasons why GLMM was used in the analysis of the reading time data in this study. As Linck and Cunnings (2015) suggested, it is challenging to generalize the findings of a research study to a wider population in SLA. They stated that researchers usually have to choose their participants from convenience samples, which requires a serious consideration of the variation within and between these different groups (i.e. classes). Second, differences among participants in terms of proficiency level, language exposure and their native languages make L2 learners a heterogeneous group, which renders it obligatory to adopt statistical techniques neutralizing the influence of these individual differences. In an attempt to deal with these challenges in SLA settings, hierarchical mixed-effects models were proposed (e.g. Goldstein, 1987; Bryk and Raudenbush, 1992; Raudenbush and Bryk, 2002). These models enable researchers to take into consideration the effects of several participant and stimulus-level independent variables in a single analysis.

The present study aims to look into the influence of independent variables (*biasing context* - SC-biasing vs. DO-biasing; *ambiguity* - ambiguous vs. unambiguous; and *group* - L1 speakers vs. L2 speakers of English) on the dependent variable (*reaction times* for the sentences participants were supposed to read). One of the expectations in the current study was that ambiguity and the incompatibility between the biasing contexts and the following syntactic structures would lead to longer reading times. Moreover, reaction times of L2 learners were predicted to be longer than those of L1 English speakers. In the analyses of these datasets, fixed effects model independent variables, whereas random effects aim to account for the random variation in the sample. The reason why mixed-effects models have taken on a prominent role in statistical analyses recently is that they incorporate both these fixed and random effects. Baayen, Davidson, and Bates (2008, p. 391) suggest that linear mixed-effects models help researchers overcome the drawbacks such as the shortage of statistical power owing to the problems with repeated observations, the absence of a flexible method that can be used in coping with missing data, and the use of different methods in the treatment of categorical and continuous data.

Considering that random variation may result from various sources, different types of random effects are taken into consideration in the analysis of the data. For instance, L2 learners from different classes in the same university and L1 English speakers from different classes in the same department provided the data for the present study. Therefore, it is possible that these different classes added random variance, which should not be ignored. To be more precise, even if the descriptive statistics indicated that L2 learners' reaction times were slower than L1 learners', it is vital to ensure that the clustering of the participants into classes did not have an influence on it. Thus, not only the random variation between classes but also the hierarchical or nested random effects must be taken into consideration (Goldstein, 1987; Snijders and Bosker, 1999; Raudenbush and Bryk, 2002). More specifically, it is likely that participants in the same group displayed differences that could stem from many different factors. To illustrate, two groups of learners with different L1 backgrounds were tested in the current study. In this case, a wide variety of factors such as the general alertness levels of the participants, the quality of sleep they got and mental fatigue are likely to bring about the random variation in the data; therefore, it can be essential to test the performances on the reading time task within participants. All these possible random variations could only be kept under control by including different types of random effects in our analyses. As the present study has an entirely between-groups design, incorporating random intercepts into the analysis would account for random variations because these intercepts take each participant's reading times into consideration regardless of ambiguity and biasing context information (see Barr, Levy, Scheepers, Tily, 2013, for further discussion).

Moreover, the linguistic materials used in the experiments could also lead to some random variation. It is usually hard to discern whether only some experimental items or the whole item set led to the results averaged over participants. As stated by Linck and Cunnings (2015), mixed-effects models provide a solution to this language-as-fixed-effect fallacy by crossing participants and items in a particular experiment at the same level of sampling. As a result, these effects outperform traditional ANOVA by eliminating the need for computing separate analyses for subjects and items (Locker, Hoffman and Bovaird, 2007; Baayen, Davidson and Bates, 2008; Quene and van den Bergh, 2008).

Taking all these into consideration, the combination of the three factors (*ambiguity, biasing context, and group*) were included for the fixed effects. They indicated that multiple participants and multiple observations per participant were tested. Random intercepts were also included so that the overall mean differences between the participants could be explained. As well as these fixed effects, *items* and *verbs* were also added to the formula as random effects.

In the analyses of the reading time data, mixed-effects models in R statistical programming language (R Core Team, 2015; The R Project for Statistical Computing; http://www.r-project.org/) were applied using lme4 package (Bates, Maechler, Bolker, Walker, 2015) . Two different criteria recommended to be used in testing significance in the applied model were considered. Essentially, t values above 2.0 were considered to be statistically significant (Gelman and Hill, 2007), and p values estimated from the t distribution were also taken into consideration for confirmation.

In brief, the analyses were done to determine whether ambiguity and biasing contexts had an influence on the resolution of temporary ambiguity and whether there was a significant interaction between these variables. Also, following the omnibus analyses including all variables and pairwise comparisons, split analyses for L1 and L2 groups were performed so that the similarities/differences between the processing patterns of L1 and L2 English speakers could be detected.

3.9. Summary

This chapter presents an explanation of the methodological framework adopted in the present study. Information about the participants, the data collection materials and procedures of the pilot study as well as the procedures followed in the corpus testing and its results are provided. The participants, data collection instruments and procedures as well as the data analysis procedures followed in Experiments 1, 2 and 3 are also explained in some detail. The data collection procedure including the pilot study and the main experiments is summarized in Table 3.7 below. The following chapter is devoted to the presentation of the results of the three main experiments and the discussion of these findings.

Table 3.7. *Experiments and duration of data collection*

	Duration	Semester
Pilot Study	1 week	fall semester, 2016
(sentence completion task)		
Experiment 1		
(sentence completion task in the absence of biasing contexts)		
L2 speaker data	2 weeks	spring semester, 2017
L1 speaker data	2 weeks	fall semester, 2017
Experiment 2		
(sentence completion task in the presence of biasing contexts)		
L2 speaker data	2 weeks	spring semester, 2017
L1 speaker data	2 weeks	fall semester, 2017
Experiment 3		
(eye-tracking experiment)	11 weeks	fall semester 2018 &
L2 speaker data		spring semester, 2019
L1 speaker data	7 weeks	spring semester, 2018

4. RESULTS AND DISCUSSION

4.1. Introduction

This chapter proceeds as follows. The first section will present the results of Experiment 1 and it will be followed by the discussion of these findings. Afterwards, the results of Experiment 2 and their comparison with those of Experiment 1 will precede a discussion of these findings. In the remaining part of the chapter, the results of Experiment 3 will be provided and the findings will be discussed.

4.2. Results of Experiment 1

Prior to the application of the log-linear analysis and the calculation of partial chi-square statistics, the overall verb bias in the data obtained from Experiment 1, irrespective of verb sense, was determined. It was revealed that the percentages of DO arguments and SC arguments were 53% and 27%, respectively in L2 speakers' sentences. Also, 6% of the sentences created by them included arguments *Other* than SCs and DOs. The remaining continuations were either classified as INC/NA or they fell into DIF-S or AMB-S categories and did not include DO arguments. In a similar manner, 64% of L1 English speaker completions included DOs, while they used SC arguments in 18% of their continuations. In 12% of their sentences, participants preferred *Other* arguments. The overall verb bias for all 20 target verbs are presented in Table 4.1.

Table 4.1. *Overall verb bias for the 20 target verbs in L1 and L2 English speakers' sentence completions (verb sense disregarded) in experiment 1*

CATEGORY	*L2 Speakers (n)*	*L1 Speakers (n)*	*CATEGORY*	*L2 Speakers (n)*	*L1 Speakers (n)*
DOS-DO	*666*	*338*	***SCS-SC***	*523*	*142*
SCS-DO	*274*	*135*	***DOS-SC***	*11*	*1*
DIF-S-DO	*77*	*33*	***DIF-S-SC***	*2*	-
AMB-S-DO	*29*	*4*	***AMB-S-DO***	-	-
TOTAL (n) (DO Arguments)	*1046 (out of 1980)*	*510 (out of 800)*	***TOTAL (n) (SC Arguments)***	*536 (out of 1980)*	*143 (out of 800)*
PERCENTAGE (DO Arguments)	*53%*	*64%*	***PERCENTAGE (SC Arguments)***	*27%*	*18%*

Note: *DOS: Direct Object Sense* *SCS: Sentential Complement Sense*
DIF-S: Different Sense *AMB-S: Ambiguous Sense*

Following this examination including all target verbs in this study, overall verb bias for each individual verb was determined and the results are demonstrated in Table 4.2. In the computation of the overall bias for each verb, the criterion determined by Garnsey et al. (1997) was used as explained in some detail in Section 3.3.

On closer examination, the majority of the target verbs were found to have DO biases in both L1 and L2 speakers' sentence continuations. To be exact, 11 out of 20 verbs were predominantly followed by DO arguments in L2 speakers' completions (*find, add, observe, grasp, recognize, reveal, establish, reflect, discover, accept* and *recall*), whereas the number of DO-biased verbs was 15 in L1 speakers' (*find, report, add, observe, bet, grasp, recognize, reveal, establish, confirm, reflect, discover, accept, recall* and *anticipate*). On the other hand, 5 verbs (*admit, indicate, bet, feel and claim*) in L2 speaker data and 3 verbs (*admit, indicate* and *feel*) in L1 speaker data turned out to be mostly followed by SC arguments. It was also observed that *report, confirm* and *anticipate* had equi-biases in L2 speakers' completions, while the only verb with EQ-bias in L1 speaker data was *claim*. Furthermore, the verb *declare* was found to have no structural bias in both datasets. Lastly, L1 and L2 speakers differed in their preferences as to the argument structures in only 5 of the verbs included (*report, bet, confirm, claim* and *anticipate*). In parallel with the overall trend discovered in the present study, L1 speakers tended to use more DO arguments following these five verbs, while they were either SC-biased or EQ-biased in L2 speaker completions.

Table 4.2. *Overall verb biases for individual verbs (irrespective of verb sense) in experiment 1*

VERB	**OVERALL VERB BIAS**	
	L2 SPEAKERS	***L1 SPEAKERS***
Accept	DO-bias (66,7%)	DO- bias (95%)
Add	DO- bias (84,8%)	DO- bias (82,5%)
Admit	SC- bias (60,6%)	SC- bias (57,5%)
Anticipate	EQ-bias (24,3% DO vs. 33,3% SC)	DO- bias (80%)
Bet	SC- bias (52,5%)	DO- bias (65%)
Claim	SC- bias (75,8%)	EQ-bias (60% SC vs. 32,5% DO)
Confirm	EQ- bias (32,4% DO vs. 42,4% SC)	DO- bias (70%)

Table 4.2. (Continued) *Overall verb biases for individual verbs (irrespective of verb sense) in experiment 1*

VERB	OVERALL VERB BIAS	
	L2 SPEAKERS	***L1 SPEAKERS***
Declare	No-bias (56,6% DO vs. 32,3% SC)	No-bias (57,5% DO vs. 30% SC)
Discover	DO- bias (74,7%)	DO- bias (75%)
Establish	DO- bias (81,8%)	DO- bias (90%)
Feel	SC- bias (6,1%)	SC- bias (5%)
Find	DO- bias (74,7%)	DO- bias (92,5%)
Grasp	DO- bias (78,8%)	DO- bias (75%)
Indicate	SC- bias (55,5%)	SC- bias (65%)
Observe	DO- bias (82,8%)	DO- bias (92,5%)
Recall	DO- bias (54,6%)	DO- bias (75%)
Recognize	DO- bias (71,7%)	DO- bias (85%)
Reflect	DO- bias (52,5%)	DO- bias (5%)
Report	EQ-bias (49,5% DO vs. 41,4% SC)	DO- bias (75%)
Reveal	DO- bias (65,6%)	DO- bias (67,5%)

In addition to the structural biases of the verbs, their dominant senses in the sentence continuations were identified. As stated in Hare et al.'s (2003, p. 286) study, in order for a verb sense to be considered dominant, at least 60% of the sentence completions of that particular verb must contain that sense. No dominant senses were reported for verbs that did not conform to this criterion. As a result of the examination of dominant verb senses, it was found that the verbs in question in the current study were biased towards the SC-senses in L2 speaker data (44% SC-sense vs. 36% DO-sense). In the remaining 20% of the sentence continuations, a different sense of the target verb was used, the sense intended by the participant was ambiguous or the completions were categorized as INC/NA. On the other hand, in the data obtained from L1 speakers, there seemed to be no apparent inclination towards one of these senses and the percentages were almost the same (44,9% DO sense vs. 44% SC sense). The frequencies and percentages of verb senses that fall into the relevant categories are given in Table 4.3.

Table 4.3. *Dominant verb senses for the 20 target verbs in L1 and L2 English speakers' sentence completions in experiment 1*

CATEGORY	*L2 Speakers (n)*	*L1 Speakers (n)*	*CATEGORY*	*L2 Speakers (n)*	*L1 Speakers (n)*
SCS-SC	*523*	*142*	***DOS-DO***	*666*	*338*
SCS-DO	*274*	*135*	***DOS-SC***	*11*	*1*
SCS- OTHER	*72*	*75*	***DOS-OTHER***	*40*	*20*
TOTAL (n) (SC-Biased Sense)	*869 (out of 1980)*	*352 (out of 800)*	***TOTAL (n) (DO-Biased Sense)***	*717 (out of 1980)*	*359 (out of 800)*
PERCENTAGE (SC-Biased Sense)	*44%*	*44%*	***PERCENTAGE (DO-Biased Sense)***	*36%*	*45%*

When the dominant senses of the verbs were examined in some detail, it was observed that in L2 speaker continuations, the DO-biased sense was dominant for 7 of the target verbs (*find, add, observe, recognize, establish, discover, accept*), whereas the SC-biased sense was dominant for 6 (*admit, indicate, reveal, confirm, claim, recall*). As to L1 speakers, for 8 out of 20 verbs, DO-biased sense was found to be dominant (*find, add, observe, bet, grasp, recognize, discover, accept*), while SC-biased sense was predominantly used in 7 of the target verbs (*admit, indicate, reveal, confirm, reflect, claim, recall*). Two groups of participants seemed to agree on the dominant verb senses of 12 out of 20 target verbs. The findings for individual verbs are listed in Table 4.4.

Table 4.4. *Dominant verb senses for individual verbs in experiment 1*

VERB	**DOMINANT SENSE**		**VERB**	**DOMINANT SENSE**	
	L2 Speakers	***L1 Speakers***		***L2 Speakers***	***L1 Speakers***
accept	DO-sense (61,6%)	DO-sense (75%)	***feel***	-	-
add	DO-sense (83,8%)	DO-sense (72,5%)	***find***	DO-sense (64,6%)	DO-sense (90%)
admit	SC-sense (88,9%)	SC-sense (100%)	***grasp***	-	DO-sense (60%)
anticipate	-	-	***indicate***	SC-sense (70,7%)	SC-sense (82,5%)

Table 4.4. (Continued) *Dominant verb senses for individual verbs in Experiment 1*

VERB	DOMINANT SENSE		VERB	DOMINANT SENSE	
	L2 Speakers	***L1 Speakers***		***L2 Speakers***	***L1 Speakers***
bet	-	DO-sense (85%)	***observe***	DO-sense (85,8%)	DO-sense (97,5%)
claim	SC-sense (87,9%)	SC-sense (85%)	***recall***	SC-sense (72,7%)	SC-sense (92,5%)
confirm	SC-sense (71,8%)	SC-sense (67,5%)	***recognize***	DO-sense (63,6)	DO-sense (67,5%)
declare	-	-	***reflect***	-	SC-sense (92,5%)
discover	DO-sense (73,7%)	DO-sense (75%)	***report***	-	-
establish	DO-sense (65,7%)	-	***reveal***	SC-sense (91,9%)	SC-sense (90%)

In addition to these structural and sense-related biases of the target verbs, *that*-preferences of the two groups of participants were calculated and it was found that L2 speakers of English used the complementizer *that* in 85% of their sentence continuations that belonged to the SCS-SC category. However, only 51% of L2 speakers' sentences contained *that*. This indicated that L2 speakers showed a much stronger preference for overt complementizers compared to L1 English speakers. The possible reasons for this tendency are discussed in section 4.3.

Summing up the results, L1 English speakers did not have a strong preference for one of the verb senses, while L2 speakers preferred DO-biased senses more often. The percentages of SFs also showed that both groups of participants tended to use the associated SFs, especially in the DO-biased sense condition. Another noticeable pattern was that L2 speakers used SC arguments more than L1 English speakers, who preferred DOs and *Other* arguments more frequently. The percentages of two predetermined senses for each verb and the SFs in the sentence completions of L1 and L2 speakers in the absence of biasing contexts are demonstrated in Table 4.5. The results of the statistical analyses on this dataset (i.e. the comparisons of the findings from two participant groups and experiments) are presented Section 4.4.

Table 4.5. *Use of sense and sense-contingent SF preferences of L1 and L2 speakers of English in the absence of biasing contexts (experiment 1)*

	SC-BIASED SENSE			
	Use of Sense (%)	***SC Argument (%)***	***DO Argument (%)***	***OTHER Argument (%)***
L1 Speakers	44,1	40,3	38,3	21,3
L2 Speakers	43,8	60,1	31,5	8,2
	DO-BIASED SENSE			
	Use of Sense (%)	***SC Argument (%)***	***DO Argument (%)***	***OTHER Argument (%)***
L1 Speakers	44,9	0,2	94,1	5,5
L2 Speakers	36,2	1,5	92,8	5,5

Apart from these overall results of the use of verb sense and SFs for the target verbs, the distribution of ten sense and SF categories in each target verb were analyzed in order to explain and exemplify their idiosyncratic occurrences. The chi-square results and relevant explanations are provided in Appendix-18.

4.3. Discussion of the Findings of Experiment 1

The two-stage categorization of the data based on the overall verb senses (*SC-biased sense* vs. *DO-biased sense*) and the preferred argument structures (*SC, DO* and *Other arguments*) in sentence completions out-of-context revealed that there were almost no differences between L1 speakers' use of the two verb senses (44% SC-biased sense vs. 45% DO-biased sense) when no biasing contexts were provided. On the other hand, it is obvious that L2 speakers had a greater tendency to use the SC-biased verb senses compared to DO-biased ones (44% SC-biased sense vs. 36% DO-biased sense). The fact that participant groups' preferences as to dominant verb senses were consistent in 12 out of 20 verbs deserves consideration since it might provide evidence for L2 speakers' native-like preferences in a vast majority of the target verbs. Also, the dominant senses of the remaining 8 verbs were not fully incompatible. In almost all of these instances, the preferences of L1 and L2 groups were the same overall; however, one of the verb senses was not selected frequently enough to be counted dominant. The assumptions that most polysemous verbs have both concrete meanings and their more abstract extensions (Lakoff, 1987; Rice, 1992) and that the activation of more concrete meanings is quicker (Schwanenflugel, Harnishfeger, and Stowe, 1988) contradicted the findings from L2 speaker group, which displayed stronger preferences for the SC-biased, mostly abstract verb senses. This might have stemmed from L2 learners' frequency of exposure to these particular senses as a great deal of research into the frequency effects on L2 showed (Larsen-Freeman, 1975; Ellis and Schmidt, 1997; Goldschneider and Dekeyser, 2001; Arnon and Snider, 2010). Considering that this group of participants mostly learnt English in a formal setting, and that they were required to read academic texts/research articles at university level, it seems very likely that they encountered the abstract senses of verbs (e.g. *discover, establish, indicate, claim*) more frequently, which could have led them to prefer these senses in their continuations.

As to whether the alleged relationship between verb sense and SFs could also be identified in sentence production, the percentages of DOs, SCs and *Other* arguments showed that DO constructions were used in almost 94% of L1 speakers' and 93% of L2 speakers' sentence continuations including DO-biased verbs. This suggests that both L1 and L2 speakers' syntactic preferences were substantially influenced by the semantic properties of the target verbs. Nevertheless, their tendency towards using the sense-contingent SFs was not so strong in verbs with SC-biased senses. Approximately 60% of the sentence continuations of L2 speakers included SCs, while 32% of them contained DOs. On the other hand, the difference in L1 group was negligible (40% SCs vs. 38% DOs) in spite of the higher percentage of SC arguments compared to DO arguments in these cases. This could be due to the fact that L1 participants favored DO arguments as completions more since they are shorter and simpler no matter which sense the verbs had. Another factor that may have led to this result is that SC-biased and DO-biased senses appear to put different constraints on the argument structures with which they can co-occur. To be more precise, DO arguments are generally allowed after verbs with SC-biased senses but the opposite does not hold. For example, in its SC-sense (i.e. declare to be true), the verb *admit* can be followed by both SCs (e.g. *He admitted that he was guilty*) and DOs (*He admitted his guilt*). However, the DO-sense of this verb (i.e. allow someone to enter a public place) permits only DO arguments as in *He admitted the students into the classroom*. Additionally, colloquial uses such as *claim innocence*, *declare war*, and *accept responsibility* require the use of DO arguments with SC-biased senses. Thus, their frequent use might have inflated the percentage of DOs following the SC-biased verb senses as reported in Hare et al.'s (2003) study. All these findings regarding the verb senses and sense-contingent SF preferences revealed that both SC-biased and DO-biased senses of verbs, though in varying degrees, activated the associated SFs. It can also be observed that L2 speakers, just like L1 speakers of English, were guided by verb semantics in their selections of argument structures despite some obvious dissimilarities.

The scarcity of research that compares L1 and L2 speakers' verb sense and associated SF preferences in a single study using the same set of verbs and stimuli was one of the strongest motives behind the present study. From this point of view, the comparisons of these two groups' preferences revealed they were similar in that the overall structural verb bias regardless of verb senses was DO, with L1 speakers having a stronger inclination to use DO arguments compared to L2 speakers (*L1 speakers:* 64% vs. *L2 speakers:* 53% DOs). When we go into more detail, it is possible to see that their preferences for overall verb biases were congruent in 15 out of 20 verbs, indicating that L2 speakers displayed native-like SF preferences following an overwhelming majority of the target verbs. Furthermore, the tendency to use SC arguments out of context was more noticeable in L2 speakers than in L1 speakers. This is also reflected in the overall structural biases of verbs when the verb sense was disregarded (*L1 speakers:* 18% vs. *L2 speakers:* 27% SCs). It is noteworthy that L2 speakers of English selected SCs even when the option of using simpler DO arguments was open to them. This seems to conflict with Andersen's (1978) *economy principle* favoring the earlier acquisition of shorter forms and their frequent use. This unanticipated tendency may have stemmed from the complex linguistic goals of these L2 learners studying at the department of English language teaching. The special effort they put into producing sophisticated sentences could have elevated the percentages of SC constructions compared to L1 speakers'. These learners also have explicit knowledge of grammatical structures because they take advanced grammar and linguistics courses, which may have influenced their sentence production patterns. As to the use of *Other* argument types, it is evident that these constructions in L1 speaker completions far outnumbered those in L2 speaker data following verbs with SC-senses (L1 speakers: 21% vs. L2 speakers: 8%). This indicates that native speakers usually have access to a wider variety of argument structures to express a particular meaning (Trueswell et al., 1993; Hare et al., 2003; Uçkun, 2012). However, both groups included them in 6% of their sentence completions containing DO-senses of verbs, which led the participants to generate DO arguments in nearly all of their sentences. The limited variety of argument structures falling into the *Other* category and L2ers' erroneous sentence completions in the present study provide evidence for their insufficient SF knowledge, supporting Sung and Kim's (2019) conclusion that the difficulties L2 learners experienced were due to the inadequacies in both lexical and constructional domains. However, their claim that the simplest argument structures were mostly used by L2 speakers did not parallel our findings since Turkish L2 speakers taking part in this study had a strong inclination towards using inherently complex sentential complements.

The small corpus testing in the present study discussed in Section 3.5 also revealed that irrespective of verb sense, the percentage of DO arguments is almost twice the percentage of SCs (53% DOs vs. 27% SCs). As is evidenced by the corpus testing and the sentence completion data out of context, the overall trend of L1 English speakers towards the frequent use of DO arguments in the present study was consistent with Hare et al.'s (2003) results. The same effect persisted in the use of sense-contingent SFs following SC-biased verb senses, with a relatively high percentage of DO arguments (38%); however, almost no SC arguments followed verbs with DO-biased senses (1,5%), probably due to the aforementioned inherent characteristics of the verbs (i.e. the limited use of SCs following the DO-senses of verbs).

When the results from the present study, previous corpus analyses, and studies conducted in L1 and L2-English settings are considered, it can be concluded that there exists a probabilistic verb sense & SF relationship and that all these analyses show evidence for a more robust relationship between them in the DO-biased verb sense condition. The argument about the significant role of verb semantics on their syntactic preferences was first put forward by Roland (2001) based on some previous accounts (Green, 1974; Levin, 1993; Pesetsky, 1995), and subsequently, some studies corroborated it with findings similar to the current one (Hare et al., 2003; Uçkun, 2012). Although the differences in the strength of this relationship in corpora and experimental studies could have been overlooked in the present study, it is worth mentioning that Roland (2001), and Roland and Jurafsky (1998) reminded us of the role of context in the selection of SFs. For example, the subject of all sentence continuations in the present study was *he* just for the sake of uniformity, so animacy may have influenced participants' SF preferences following such verbs as *reflect* and *indicate*. However, as a big majority of the target verbs can have both animate and inanimate subjects, this is unlikely to have had a major effect on the direction of the findings.

Lastly, a comparative examination of the SF preferences in corpora and sentence production tasks disclosed that the percentages of DO and SC arguments were strikingly similar, which contradicted a good deal of research having found out that the percentages of DO constructions were inflated in sentence completion tasks compared to those obtained through corpora analyses (Merlo, 1994; Roland and Jurafsky, 1998; Hare et al., 2003). However, this claim was substantiated when the SF preferences were determined based on verb senses. In other words, in the analysis of sense-contingent SFs, remarkably more DO arguments were used by participants in sentence completion tasks compared to the numbers and frequencies of these argument types in corpora.

In sum, some manifest differences were detected between L1 and L2 speakers' sense and SF selections. These differences may have their roots in several factors which the current research did not delve deeply into. The input L2 speakers were provided with, verb patterns and their frequencies in their L1s or some universal patterns might have been the underlying determinants of the participants' choices. Although it is more than likely that L1-related factors as well as L2-inherent ones played a part in this process, some idiosyncrasies uncovered could have resulted from the amount of exposure to various complement types. As Tono (2004) stated, making multiple comparisons of interlanguage, first language and second language corpora may cast new light on the interlanguage development. Considering that textbooks are the major source of input in foreign language environments, frequency of exposure can be brought forward as a logical reason, along with many others, for the variations in L1 and L2 speakers' preferences.

Finally, the examination of the *that*-preferences of L1 and L2 English speakers displayed that L2 speakers had a stronger tendency to use overt complementizers, while omission of *that* was observed more often in L1 speaker data regardless of the presence of biasing contexts. This is in line with the findings of several L2 studies (Durham, 2011; Llinàs-Grau, Pladevall and Capdevila, 2013; Wulff, Lester and Martinez-Garcia, 2014). Some of these studies attributed these differences to the L1 backgrounds of learners and thus to L1 transfer. The effect of L1 transfer could also be taken into consideration although this study did not directly address the complex phenomenon of subordination in Turkish and its effect on transfer in learning English. As it is well-known, Turkish is a verb final language with highly agglutinating morphology. Instead of separate complementizers, Turkish subordinate clauses are obtained by attaching bound morphemes at the end of the verb stem at final position in the subordinate clause. This subordinating bound morpheme marks the termination of the subordinate clause. It may be the case that the participants of this study may have expected the beginning of the subordinate clause in English would be marked with an overt complementizer just as the end boundary of the subordinate clause is marked with an overt subordinator in Turkish. This suggestion on the *that* complementizer preference of Turkish learners of English can be tested in future studies.

On the other hand, there are researchers suggesting that the incomplete acquisition of communicative competence (Hymes, 1972) and sociolinguistic competence (Regan, 1995; Dewaele, 2004) lead to these differences in the application of variable rules. They also claimed that these competence types are intrinsic parts of the mastery of a language. Moreover, the fact that free variation was observed in L1 speaker completions once again raised the question of whether this variation was really free, or some factors played a role in the overtness of the complementizers. Several studies in L1 literature listed formality, frequency of matrix verb, structural complexity of the subordinate clause (Bolinger, 1972; Elsness, 1984; Rohdenburg, 1996), verb tense and matrix subject (Thompson and Mulac, 1991; Jaeger, 2010) as factors contributing to the overt use or omission of complementizers. In the present study, the development of communicative and sociolinguistic competence, formality and the frequency of matrix verbs may have had an influence on the *that*-preferences of L2 learners. Lastly, the fact that the participants are exposed to the formal spoken and written language in the school context in an EFL environment could have resulted in their higher proportions of complementizer use.

4.4. Results of Experiment 2 and their Comparison with the Results of Experiment 1

As in Experiment 1, contingency tables showing the numbers and percentages in each one of the pre-specified categories were created by using the categorical data collected for Experiment 2. The percentages of two groups of participants' use of SC-biased and DO-biased verb senses as well as their preferences as to the use of SC, DO and *Other* arguments in both categories in the absence and presence of biasing contexts are illustrated in Table 4.6. The data in two verb-sense categories were examined separately through hierarchical log linear analyses and chi-square tests so that the effects of *group* and *experiment* in each category could be revealed.

Table 4.6. *Use of sense and sense-contingent SF preferences of L1 and L2 speakers of English in the absence (experiment 1) and presence (experiment 2) of biasing contexts*

			SC-BIASED SENSE		
		Use of Sense (%)	***SC Argument (%)***	***DO Argument (%)***	***OTHER Argument (%)***
EXP 1 (biasing contexts absent)	*L1 Speakers*	44,1	40,3	38,3	21,3
	L2 Speakers	43,8	60,1	31,5	8,2
EXP 2 (biasing contexts present)	*L1 Speakers*	94,9	66	25,6	8,4
	L2 Speakers	78,1	72,7	20,6	6,6
		DO-BIASED SENSE			
		Use of Sense (%)	***SC Argument (%)***	***DO Argument (%)***	***OTHER Argument (%)***
EXP 1 (biasing contexts absent)	*L1 Speakers*	44,9	0,2	94,1	5,5
	L2 Speakers	36,2	1,5	92,8	5,5
EXP 2 (biasing contexts present)	*L1 Speakers*	78,5	6,1	89,3	4,6
	L2 Speakers	61,4	8,4	83,9	7,6

Prior to the presentation of the results regarding the SC-biased verb senses, two participant groups' *that*-preferences in sentence completions (SCS-SC constructions) were calculated and the results demonstrated that the complementizer was present in 79% of L2 speakers' and 57% of L1 speakers' sentence completions preceded by biasing contexts. The comparison of these percentages with those in Experiment 1 showed that the overall pattern remained the same, with higher proportions of L2 speaker continuations containing *that*. However, the presence of context sentences was found to have led to a decline in the use of overt complementizers.

4.4.1. Results of log-linear analyses and chi-square tests for the SC-biased verb senses and sense-contingent SFs in experiment 2

The first step of log-linear analysis pertained to the use of SC-biased senses of the target verbs (counts and percentages are given in Table 4.7). A 2x2x2 correlation matrix including three factors each one of which was composed of two levels was utilized to conduct the analysis. It concerned the associations between the factors *Use of SC-Sense* (*preferred* vs. *not preferred*), *Group* (*L1* vs. *L2* speakers of English) and *Experiment* (*Experiment 1*- biasing contexts absent vs. *Experiment 2* - biasing contexts present).

Table 4.7. *Numbers and percentages of the use of SC-biased verb senses by L1 and L2 speakers of English in the absence and presence of biasing contexts in experiment 2*

GROUP			SC-BIASED SENSE	
			Use of Sense (count)	***Use of Sense (percentage)***
Experiment 1 *(biasing contexts absent)*	***L2 Speakers*** *(n = 1980)*	preferred	869	43,9%
		not preferred	1111	
	L1 Speakers (n = 800)	preferred	352	44,1%
		not preferred	448	
Experiment 2 *(biasing contexts present)*	***L2 Speakers*** *(n = 2160)*	preferred	844	78,1%
		not preferred	236	
	L1 Speakers *(n = 1600)*	preferred	759	94,9%
		not preferred	41	

With the aim of determining the individual effects and the strength of the associations among the variables, hierarchical log-linear analysis was computed, and parameter estimates for the hierarchical saturated model were obtained. Main effects and interaction effects including the target variables as well as the parameter estimations (z values) are displayed in Table 4.8.

Table 4.8. *Results of parameter estimates (for the use of SC-biased senses of verbs) in Experiment 2*

Effect	Parameter	Estimate	Std. Error	Z	Sig.
Group*Exp.*Use of SC-biased sense	1	-,204	,024	-8,365	,000
Group*Exp.	1	-,004	,024	-,184	,854
Group *Use of SC-biased sense	1	,205	,024	8,414	,000
Exp.*Use of SC-biased sense	1	,583	,024	23,955	,000
Group	1	,457	,024	18,773	,000
Exp.	1	,399	,024	16,373	,000
Use of SC-biased sense	1	-,462	,024	-18,961	,000

The results revealed that the main effects of *experiment* (the absence/presence of SC-sense-biasing contexts) (z = 16,373, $p < .0001$) and *group* (z = 18,773, $p < .0001$) were significant, as was the main effect of *the use of SC-biased verb senses* (z = -18,961, $p < .0001$). Moreover, a statistically significant z-value was found for the three-way interaction (z = -8,365, $p < .0001$) among *group, experiment* and *use of SC-biased sense*. At first sight, this interaction implied that L1 speakers of English, compared to L2 speakers, had a stronger inclination towards using the SC-biased senses more frequently in both experiments.

Also, the analysis revealed evidence for significant two-way interactions between *group * use of SC-biased sense* (z = 8,414, $p < .0001$) and *experiment * use of SC-biased sense* (z = -23,955, $p < .0001$), confirming that both the participant groups and the presence/absence of biasing contexts were related to their preferences in the use of SC-biased verb senses. To be more precise, the *group * use of SC-biased sense* interaction demonstrated that L1 speakers of English used SC-senses more frequently compared to L2 speakers regardless of the presence of biasing contexts. Likewise, the statistically significant association between *experiment* and *the use of SC-biased senses* suggested that regardless of the group, SC-biased senses of verbs were preferred more often in Experiment 2, when they were provided with SC-sense biasing contexts than they did in Experiment 1, when there was no context.

As a next step, partial chi-square tests were performed so that the question of exactly which levels differed could be addressed directly. To begin with, the association between the variables *group* and *the use of SC-biased sense* in the absence and presence of biasing contexts was investigated. The statistics revealed that L1 and L2 speakers did not display a statistically significant difference in their use of SC-biased verb senses (*L1 speakers:* 44%; *L2 speakers:* 44%) when they were not provided with contexts promoting these particular senses of the verbs (Experiment 1) ($X^2 = 0{,}003$, $p = 0{,}957$). However, in the presence of biasing contexts, L1 speakers were inclined to use the SC-biased senses more frequently than L2 speakers (*L1 Speakers:* 95%; *L2 Speakers:* 78%). This difference reached significance ($X^2 = 102{,}350$, $p < {,}0001$), indicating that L1 speakers showed greater sensitivity to SC-biasing contexts compared to L2 speakers.

Another chi-square analysis was run to look into the changes in the participants' use of the SC-biased senses between the two experiments. The results demonstrated a considerable increase in the use of SC-biased verb senses in Experiment 2 (in the presence of biasing contexts). This sharp increase was found to be statistically significant (X^2 = 99,614, p < ,0001), revealing that regardless of the group, participants were inclined to use SC-senses more frequently in the presence of context sentences promoting this intended sense.

Moreover, performing one more partial Chi-square test was required to explore whether the increase in the use of SC-biased senses in the presence of context sentences (in Experiment 2) was significant in both groups of participants (L1 and L2 English speakers) or the increase in only one of these groups caused the statistically significant overall group effect. The results revealed that the increase in the use of SC-biased senses when the sentences were accompanied by context sentences (Experiment 2) compared to the participants' completions out of context (Experiment 1) was statistically significant in both L1 (X^2 = 487,850, p < ,0001) and L2 (X^2 = 332,844, p < ,0001) speakers. This suggested that both groups were considerably influenced by the presence of biasing contexts (*L1 speakers: Exp1:* 44% - *Exp2:* 95%; *L2 speakers: Exp1:* 44% - *Exp2:* 78%).

Following the analyses conducted on the data related to the use of SC-biased senses, L1 and L2 speakers' SF selections were analyzed through a series of statistical tools. As in the analysis of the sense-related data, hierarchical log linear analysis was performed to find whether there were significant main effects and associations among the variables *SF preferences*, *group* and *experiment*. Of these three factors, *group* had two levels (*L1* and *L2* speakers of English) as did *Experiment* (*Experiment 1*- biasing contexts absent and *Experiment 2* - biasing contexts present). The third variable *SF preferences*, however, had three levels (*SC arguments, DO arguments* and *Other arguments*). This, therefore, required the use of a 3X2X2 correlation matrix in the analysis. The counts and percentages of the use of SC-biased sense and sense-contingent SFs are presented in Table 4.9.

Table 4.9. *Numbers and percentages of the use of SC-biased verb senses and SF preferences by L1 and L2 speakers of English in the absence and presence of biasing contexts in experiment 2*

				SC-BIASED SENSE		
			Use of Sense	***SC Arg.***	***DO Arg.***	***Other Arg.***
Experiment 1 ***(biasing contexts absent)***	***L2 Speakers (n = 869)***	*count*		523	274	72
		percentage	*43,9%*	*60,1%*	*31,5%*	*8,2%*
	L1 Speakers **(n = 352)**	*count*		142	135	75
		percentage	*44%*	*40,3%*	*38,3%*	*21,3%*
Experiment 2 ***(biasing contexts present)***	***L2 Speakers (n = 844)***	*count*		614	174	56
		percentage	*78,1%*	*72,7%*	*20,6%*	*6,6%*
	L1 Speakers **(n = 759)**	*count*		501	194	64
		percentage	*94,9%*	*66%*	*25,6%*	*8,4%*

Parameter estimates for the hierarchical saturated model were computed. Table 4.10 demonstrates the z-values and p-values for the main and interaction effects. It was found that the main effects of *SF preferences* (z = 27,357, $p < .0001$; z = 3,111, $p < .01$), *group* (z = 6,269, $p < .0001$) and *experiment* (z = -2,990, $p < .01$) were all statistically significant. Furthermore, taken in its entirety, the three-way interaction among *group, experiment and SF preferences,* similarly, turned out to be statistically significant (z = 3,545, $p < .0001$), indicating that L2 speakers of English preferred SC arguments following SC-biased senses of verbs more often in both the absence and presence of biasing contexts, whereas L1 speakers tended to use DO constructions and *Other* arguments more frequently in both experiments.

Evidence for significant *group * experiment* (z = 6,514, $p < .0001$) and *experiment * SF preference* (z = -9,169, $p < .0001$; z = 2,984, $p < .001$) associations was also found. The latter confirmed that participants' SF preferences were largely determined by the absence/presence of SC-sense biasing contexts. Put another way, both groups of participants used more SC arguments and fewer DO and *Other* arguments when the contexts biased them towards the SC-senses (Experiment 2). This confirmed that biasing contexts enabled both L1 and L2 speakers to choose the sense-contingent SFs in their sentence completions. Also, it was revealed that the interaction between *group* and participants' *SF preferences* was statistically significant (z = 7,104, p < .0001; z = -,341, p = ,733), which demonstrated that regardless of the experiment, L2 speakers had a stronger inclination towards using SCs compared to L1 speakers. As a natural consequence of this, DO and *Other* arguments in L1 speakers' sentence continuations outnumbered the ones in L2 speakers'.

Table 4.10. *Results of parameter estimates (for the use of SC-biased senses of verbs) in Experiment 2*

Effect	Parameter	Estimate	Std. Error	Z	Sig.
Group*Exp*SF Pref.	1	,107	,030	3,545	,000
	2	,037	,033	1,096	,273
Group*Exp.	1	,167	,026	6,514	,000
Group*SF Pref.	1	,215	,030	7,104	,000
	2	-,011	,033	-,341	,733
Exp.*SF Pref.	1	-,278	,030	-9,169	,000
	2	,100	,033	2,984	,003
Group	1	,161	,026	6,269	,000
Exp.	1	-,077	,026	-2,990	,003
SF Pref.	1	,829	,030	27,357	,000
	2	,104	,033	3,111	,002

As in the analysis of the use of verb senses, partial chi-square tests were run on the data showing participants' SF preferences. Among them, the chi-square test statistics of the *group * SF preferences* interaction in the absence and presence of SC-sense biasing contexts provided explanations about whether two participant groups' SF preferences were influenced by context sentences. Another specific aim here was to find out whether proficient L2 speakers' SF preferences bore a resemblance to those of L1 English speakers. The results pointed to a statistically significant difference between L1 and L2 speakers (X^2 = 56,875, p < ,0001) in their SF preferences (SC, DO or *Other* arguments) following the SC-biased verb senses in the absence of biasing contexts (Experiment 1). While the percentage of SC arguments used by L2 speakers was 60%, approximately 40% of L1 speakers' continuations contained these arguments. As to their use of DO arguments, the percentages for L1 and L2 speakers were 38% and 31%, respectively. In addition, L2 speakers used arguments *Other* than SCs and DOs in 8% of their sentences, while the percentage of this argument type was 21% for L1 speakers. Likewise, when the participants were provided with SC-biasing contexts (Experiment 2), the two groups once again differed in their SF preferences to a large extent (X^2 = 8,589, p < ,05). To be more precise, L2 speakers preferred SC arguments in 73% of their completions, while the percentage of SCs in L1 speaker data was 66%. Also, 26% of L1 speakers' and 21% of L2 speakers' sentences included DO arguments. *Other* arguments constituted 8% of L1 speaker and 7% of L2 speaker continuations. To sum up, in both experiments, L2 speakers of English tended to use more SCs compared to L1 speakers, who preferred DOs and *Other* arguments more frequently than L2 speakers. These differences in their SF selections turned out to be statistically significant.

In another chi-square analysis, changes in L1 and L2 speakers' use of three different types of SFs between the two experiments were examined. The primary aim of this test was to find out whether L1 speakers and proficient L2 speakers differed in their reactions to biasing contexts. Statistically significant differences in the use of SC, DO and *Other* arguments by both L1 speakers (X^2 = 72,522, p < ,0001) and L2 speakers (X^2 = 31,246, p < ,0001) were observed when their sentence continuations in the absence and presence of context sentences were compared. In other words, L1 and L2 speakers showed a marked tendency to use more SCs when they were provided with SC-biasing contexts. As a consequence of the SC-biasing effect of the context sentences, decreases in the numbers of DOs and *Other* arguments in both groups' continuations were observed.

The last chi-square test aimed to clarify and compare participants' use of SC, DO and *Other* arguments in the absence and presence of biasing contexts separately. The statistics indicated that both participant groups used higher proportions of SC arguments when the intended senses of the target verbs were promoted (Experiment 2) than when the sentence fragments were given out of context (Experiment 1). This difference in the use of SC arguments between the two experiments was found to be statistically significant (X^2 = 100,371, p < ,0001). When their use of DO arguments following SC-biasing contexts was looked into, it was observed that L1 and L2 speakers, once again, displayed a similar pattern. Both groups included fewer DO arguments in Experiment 2 than in Experiment 1, and these decreases in the number of DOs in Experiment 2 reached significance level (X^2 = 30,824, p < ,0001). As for the use of *Other* arguments, it appeared that the upward trend in the use of SC arguments was reversed. In both groups, the numbers of arguments classified as *Other* were fewer when the biasing contexts were present; however, the marginal decrease in their use by both L1 and L2 speakers did not approach significance (X^2 = ,142, p = ,707).

In the application of hierarchical log-linear modeling, the main results were provided by the parameter estimates. However, some other tests were conducted to simplify the model and to measure its fit to the data. To begin with, K-way and higher-order effects were tested in order to find out whether any of the components can be removed from the saturated model including all main effects and interactions. After the computation of the parameter estimates reported above, backward elimination statistics were computed so that the least complex model possible would be obtained. Lastly, goodness-of-fit tests were run for the purpose of confirming that the model implemented up until then was the most parsimonious one. The results of these tests that were performed using the sense-related data and SF-preference data following SC-biased verb senses are provided in Appendices 19 and Appendix 20, respectively.

4.4.2. Results of log-linear analyses and chi-square tests for the DO-biased verb senses and sense-contingent SFs in experiment 2

Subsequent to the analyses of the use of SC-biased verb senses and the SFs following these verbs, the same three-way hierarchical log-linear analysis was run as the second main step in the examination of the verb-sense related data. All the statistical analyses explained in the previous section were also performed with the aim of finding more about L1 and L2 English speakers' use of DO-biased senses of the verbs in the absence and presence of biasing contexts. *Use of DO-biased sense* (*preferred* vs. *not preferred*), *Group* (*L1* vs. *L2* speakers of English) and *Experiment* (*Experiment 1*- biasing contexts absent vs. *Experiment 2* - biasing contexts present) were the three factors included at the second stage of the analysis and each one of them had two levels. Table 4.11 presents the 2x2x2 correlation matrix showing the numbers and percentages of the use of DO-biased senses by the two participant groups in the two experiments conducted. As in the first analysis concerning the use of SC-biased senses, a saturated model including all possible main and interaction effects was first implemented.

Table 4.11. *Numbers and percentages of the use of DO-biased verb senses by L1 and L2 speakers of English in the absence and presence of biasing contexts in experiment 2*

GROUP			DO-BIASED SENSE	
			Use of Sense (count)	***Use of Sense (percentage)***
Experiment 1 *(biasing contexts absent)*	***L2 Speakers (n = 1980)***	preferred	717	36,2%
		not preferred	1263	
	***L1 Speakers* (n = 800)**	preferred	359	44,9%
		not preferred	441	
Experiment 2 *(biasing contexts present)*	***L1 Speakers (n = 2160)***	preferred	664	61,4%
		not preferred	416	
	L1 Speakers (n = 1600)	preferred	628	78,5%
		not preferred	172	

First, parameter estimates for the hierarchical saturated model were computed. As the parameter estimates and the significance values in Table 4.12 show, all first, second and third-order effects had significant roles. The analysis displayed that the main effects of *experiment* (DO-sense-biasing contexts) (z = 11,518, $p < .0001$), *group* (z = 19,688, $p < .0001$) and the *use of DO-biased verb senses* (z = -7,264, $p < .0001$) were all significant. Moreover, the three-way interaction among the variables *group * experiment * use of DO-biased sense* turned out to be statistically significant (z = -3,419, $p < .0001$), and this confirmed that in both experiments, DO-biased senses of verbs were used more frequently by L1 speakers.

Table 4.12. *Results of parameter estimates (for the use of DO-biased senses of verbs) in experiment 2*

Effect	Parameter	Estimate	Std. Error	Z	Sig.
Group*Exp*Use of DO-biased sense	1	-,058	,017	-3,419	,001
Group*Exp.	1	,101	,017	5,917	,000
Group*Use of DO-biased sense	1	,148	,017	8,715	,000
Exp.*Use of DO-biased sense	1	,316	,017	18,598	,000
Group	1	,335	,017	19,688	,000
Exp.	1	,196	,017	11,518	,000
Use of DO-biased sense	1	-,124	,017	-7,264	,000

Also, evidence for the existence of significant two-way interactions between *group * use of DO-biased sense* (z = 8,715, *p* < .0001), *experiment * use of DO-biased sense* (z = 18,598, *p* < .0001) and *group * experiment* (z = 5,917, *p* < .0001) was obtained, suggesting that the use of DO-biased verb senses was determined not only by the native languages of the participants but also by whether or not they were provided with the DO-sense biasing contexts. The statistically significant interaction between the *group* and the participants' *use of DO-biased senses* displayed that DO-biased verb senses were used more commonly by L1 speakers compared to L2 speakers. Finally, *experiment and use of DO-biased sense* association turned out to be significant at p = 0,0001, confirming that both groups of participants preferred DO-biased senses more frequently in the presence of the biasing contexts (in Experiment 2).

The final step followed for the analysis of the sense-related data was to conduct some post-hoc tests, i.e. some partial chi-square tests. First of all, the nature and strength of the interaction between *group* and *use of DO-biased verb senses* in the absence and presence of biasing contexts provided evidence revealing whether L2 speakers could perform in the same manner as L1 speakers in the production of language. Based on the chi-square and significance values, statistically significant differences in L1 and L2 speakers' use of DO-biased senses both in the absence and presence of context sentences were detected. To be more specific, in Experiment 1 (when the participants were not provided with biasing contexts), L1 speakers differed from L2 speakers in that they had a stronger tendency to use the DO-biased senses of the target verbs (*L1 speakers:* 45% vs. *L2 speakers:* 36%). The difference between the verb sense preferences of these two groups turned out to be statistically significant (X^2 = 18,024, *p* < 0,0001). In the same way, L1 speakers outperformed L2ers in the use of DO-biased senses in the presence of biasing contexts (*L1 speakers:* 79% vs. *L2 speakers:* 62%). A significant difference between these two groups was also found (X^2 = 61,926, *p*< ,0001), which suggested that L2 speakers did not display as strong an inclination as L1 speakers towards using DO-biased senses of the target verbs.

Secondly, whether or to what extent the presence of biasing contexts changed the participants' DO-biased sense preferences was examined through another chi-square test. The findings revealed that regardless of the group, a marked preference for the DO-biased verb senses was observed when the context sentences promoted this particular sense

(Experiment 2), yielding a statistically significant effect of biasing contexts on the participants' use of DO-biased senses ($X^2 = 56{,}112$, $p < {,}0001$).

Additionally, in order to find out which level of the *group* variable led to the marked increase in the use of these particular senses in the presence of context sentences, one more chi-square test was run. The values obtained as a result of the comparison of the increases in the use of DO-biased senses in Experiment 1 and Experiment 2 demonstrated that not only L1 ($X^2 = 191{,}358$, $p < {,}0001$) but also L2 ($X^2 = 180{,}200$, $p < {,}0001$) speakers were substantially affected by the presence of biasing contexts, although they seemed to have a bit stronger influence on L1 speakers (*L1 speakers:* Exp1: 45% - Exp2: 79% vs. *L2 speakers:* Exp1: 36% - Exp2: 61%).

Subsequent to the analysis of the data concerning the use of DO-biased verb senses, the argument structure preferences of the two groups in the absence and presence of contexts promoting DO-senses were examined more closely through a hierarchical log-linear model. Main effects and interactions among the variables *SF preferences*, *group* and *experiment* were examined. The variables *Group* (*L1* and *L2* speakers of English) and *Experiment* (*Experiment 1*- biasing contexts absent and *Experiment 2* - biasing contexts present) had two levels, while *SF preferences* had three (*SC arguments, DO arguments* and *Other arguments*). The results are summarized in a 3X2X2 correlation matrix (counts and percentages are provided in Table 4.13).

Table 4.13. *Numbers and percentages of the use of DO-biased verb senses and SF preferences by L1 and L2 speakers of English in the absence and presence of biasing contexts*

				DO-BIASED SENSE		
			Use of Sense	***SC Arg.***	***DO Arg.***	***Other Arg.***
Experiment 1 ***(biasing contexts absent)***	***L2 Speakers (n = 716)***	*count*		11	665	40
		percentage	*36,2%*	*1,5%*	*92,8%*	*5,5%*
	L1 Speakers **(n = 359)**	*count*		1	338	20
		percentage	*44,9%*	*0,2%*	*94,1%*	*5,5%*

Table 4.13. (continued) *Numbers and percentages of the use of DO-biased verb senses and SF preferences by L1 and L2 speakers of English in the absence and presence of biasing contexts*

				DO-BIASED SENSE		
			Use of Sense	***SC Arg.***	***DO Arg.***	***Other Arg.***
Experiment 2 *(biasing contexts present)*	***L2 Speakers (n = 664)***	*count*		56	556	52
		percentage	*61,4%*	*8,4%*	*83,7%*	*7,8%*
	***L1 Speakers* (n = 628)**	*count*		38	561	29
		percentage	*78,5%*	*6%*	*89,3%*	*4,6%*

The results of the parameter estimates presented in Table 4.14 indicated that the three-way interaction among *group, experiment* and participants' *SF preferences* was not statistically significant (z = 1,381, *p* = ,167; z = - ,397, *p* = ,692). However, the main effects of *SF preferences* (z = 9,862, *p* < .0001; z = 25,934, *p* < .0001), *group* (z = 4,501, *p* < .0001), and *experiment* (z = -5,996, *p* < .0001) all reached significance level.

Table 4.14. *Results of parameter estimates (for the use of DO-biased senses of verbs) in experiment 2*

Effect	**Parameter**	**Estimate**	**Std. Error**	**z**	**Sig.**
Group*Exp*SF Pref.	1	,210	,152	1,381	,167
	2	-,032	,081	-,397	,692
Group*Exp.	1	,204	,080	2,531	,011
Group*SF Pref.	1	,243	,152	1,600	,110
	2	-,195	,081	-2,397	,017
Exp.* SF Pref.	1	-,727	,152	-4,785	,000
	2	,401	,081	4,916	,000
Group	1	,362	,080	4,501	,000
Exp.	1	-,482	,080	-5,996	,000
SF Pref.	1	-1,498	,152	-9,862	,000
	2	2,113	,081	25,934	,000

Moreover, the presence of a significant association between *group* and *experiment* was evident, probably because of the participation of different numbers of L1 and L2

English speakers in the experiments (z = 2,531, $p < .05$). As for the *experiment * SF preference* interaction, two statistically significant p values for the two parameters were calculated (z = -4,785, $p < .0001$; z = 4,916, $p < .0001$). This put forward the remarkable influence of biasing contexts on the participants' SF preferences. An overall comparison of the results obtained from Experiments 1 and 2 revealed that, contrary to expectations, fewer proportions of DO arguments were used by both L1 and L2 speakers when the DO-sense biasing contexts were provided (Experiment 2). To put it in a different way, irrespective of their native languages, participants had a much stronger inclination to use DO arguments out of context. It is also obvious that their preferences for the SFs contingent on the DO-biased senses were not as marked as those for the SFs contingent on the SC-senses of verbs.

The last two-way interaction between *group* and the *SFs* selected was, on the whole, statistically significant even though one of the parameters could not reach significance (z = 1,600, p = ,110; z = -2,397, $p < .05$). This implies regardless of the presence of biasing contexts, L1 speakers used more DO arguments than L2 speakers did. As expected, this tendency led to lower numbers of SCs and *Other* argument types in the L1 speaker group.

The empirical data on the use of various SFs were also analyzed through partial chi-square tests. Initially, the interactions between *group* and *preferred SFs* following the DO-biased senses of the verbs in Experiment 1 and Experiment 2 were examined separately. The chi-square tests gave completely different results in two experiments. Putting this more precisely, no statistically significant differences in the use of SFs were detected between L1 and L2 English speakers (X^2 = 3,430, p = ,180) in the absence of biasing contexts. The slightly higher percentage of SC arguments in L2 speakers' continuations (*L1 speakers:* 0,2% vs. *L2 speakers:* 1,5%), the imperceptible tendency of L1 speakers towards using more DO arguments (*L1 speakers:* 94% vs. *L2 speakers:* 93%) and the equal percentages of *Other* types of arguments (*L1 speakers:* 5,5% vs. *L2 speakers:* 5,5%) seem to have resulted in this minor and insignificant difference. On the contrary, when the participants were biased towards the target verb senses (Experiment 2), two groups displayed diverse preferences as to the use of SFs, and the differences between L1 and L2 speakers' completions were found to be statistically significant (X^2 = 9,004, p < ,05). When their selections are considered in finer detail, it can be seen that L2 speakers used DO arguments in almost 84% of the sentence continuations, while L1 speakers included them in 89% of their sentences. As to the use of SCs following the DO-biased senses, they constituted approximately 8% of L2 speaker completions and 6% of L1 speaker completions. Also, different types of arguments *Other* than SCs and DOs were observed in almost 8% of the sentences produced by L2 speakers, whereas the percentage of these argument types was only 5% in L1 English speaker data. In brief, regardless of the presence of biasing contexts, L2 speakers preferred more SC arguments, whereas the number of DOs used by L1 speakers was remarkably higher compared to those of L2 speakers.

Another chi-square analysis revealed the patterns and changes in participants' SF preferences separately in the absence (Experiment 1) and presence (Experiment 2) of biasing contexts. The analysis, the ultimate aim of which was to find out the reactions of each participant group to the presence of sense-promoting context sentences, showed that L2 speakers were strongly influenced by the presence of DO-biasing contexts as the difference in the SF preferences between Experiment 1 and Experiment 2 was statistically significant (X^2 = 39,616, p < ,0001). Nevertheless, the decline in the number of DOs (*Exp.1* = 93% vs. *Exp.2* = 84%) and the increase in the use of SCs (*Exp.1* = 2% vs. *Exp.2* = 8%) and *Other* argument types (*Exp.1* = 6% vs. *Exp.2* = 8%) were totally unexpected since the contexts were intended to promote the DO senses of the verbs and thus the associated SFs. A similar trend was observed in L1 speaker data, as well. A statistically significant difference between the SF preferences of L1 English speakers between the two experiments was detected (X^2 = 20,263, p < ,0001). While the percentages of DO arguments (*Exp.1* = 94% vs. *Exp.2* = 89%), and *Other* arguments (*Exp.1* = 6% vs. *Exp.2* = 5%) fell, SCs were used a lot more frequently by them in the presence of DO-biasing contexts (*Exp.1* = 0,2% vs. *Exp.2* = 6%).

Finally, a closer look at the use of SCs, DOs and *Other* arguments was taken. In other words, the use of each one of these argument types was examined taking into consideration the effects of the two key variables, i.e. *group* and *experiment*. According to the chi-square results, statistically significant differences were observed in the use of SC arguments in the two experiments (X^2 = 4,713, p < ,05). In a similar way, the analysis of the use of DO arguments displayed a statistically significant difference (X^2 = 59,087, p < ,0001). However, group and the presence of biasing contexts seemed to have no powerful effect on the use of *Other* argument types (X^2 =,093, p = ,761).

As in Section 4.4.1, the results of the tests performed for the simplification of the model and the measurement of its fit to the DO-sense data and SF-preference data following DO-senses of the verbs are presented in Appendices 21 and 22, respectively.

4.5. Discussion of the Findings of Experiment 2

In Experiment 2, which was conducted to investigate the effect of biasing contexts on the activation of the intended verb senses and SFs, it is evident that verb senses promoted by the context sentences were retrieved and used by both groups of participants in both context-type conditions. However, in both L1 and L2 speaker groups, SC-biasing contexts seem to have had a stronger impact on the activation of the SC-biased verb senses compared to the extent to which DO-biasing contexts triggered the use of DO-senses as in Hare et al.'s (2003) and Uçkun's (2012) studies. As evidenced by several word-recognition studies, the frequency of occurrence of each verb sense and the presence of biasing contexts can be listed as two of the factors determining the degree of activation of verb senses (Altmann, 1998). For example, in an overwhelming majority of both L1 and L2 speakers' sentence completions, *feel* was used as a linking verb and thus in a sense different from the intended ones. This may suggest that this particular sense of the verb is so common in the language that the contexts were not strong enough to override this frequency effect.

When the conditions in which sense-promoting contexts were absent and present were compared, it could obviously be seen that there were sharp increases in the use of target verb senses in cases where the biasing contexts were given. Although the differences between the two experiments turned out to be statistically significant in both groups, biasing contexts appeared to have a more robust effect on L1 speakers' preferences. That is to say, L1 English speakers were more sensitive to the semantic cues provided and thus made their choices of verb senses accordingly.

When the sense-contingent SF preferences of the participants were examined, it was found that there were considerable increases in the proportions of SC arguments when the fragments were accompanied by SC-biasing contexts in both L1 and L2 speaker data. This can be due to the fact that participants could only use the simpler and more frequent DO arguments on condition that they were compatible with the existing context. Rather than using the economical, readily accessible or idiomatic expressions, participants were required to complete the scenario by sensibly making use of the information provided by the context sentences. The frequent use of sense-contingent SFs cannot be accounted for solely by this; however, it might have contributed to the stimulation of the verb sense and SF mappings that were supposed to be available. In contrast, when the fragments were preceded by DO-biasing contexts, the proportions of DO arguments in both groups decreased substantially (*L2 speakers:* Exp.1: 92% vs. Exp.2: 83%; *L1 speakers:* Exp.1: 94% vs. Exp.2: 89%). Even though sense-contingent DO arguments were seemingly far more frequent than SC arguments, a comparison with the first experiment demonstrated that they were used a lot more often out-of-context. When the participants were provided with some additional information, the percentages of these constructions decreased. This could be due to the rise in the number of SCs in L1 speakers' continuations and the increased use of SCs and *Other* arguments by L2 speakers. In other words, in the presence of DO-biasing contexts, there seemed to be a greater variety of argument structures, especially in L2 speakers' completions, as in the sentences (1a) and (1b) below:

> Mary and Mike, psychologists examining people's behaviors while strolling among the crowd, sat on a bench in the busiest street in Manhattan for weeks. They observed_______________
>
> (1a) how people interacted with each other.
>
> (1b) and made notes.

The proportions of these *Other* complements in the present study were higher in SC-biasing context condition than in DO-biasing one. This is probably because SC-sense verbs permit a greater variety of argument structures and that SC arguments can be replaced by *Wh*-complements, gerunds or infinitives in these cases. The use of these various constructions with SC-bias verbs also seems to be restricted by the presence of the SC-biasing contexts in both groups, with a sharper decrease in L1 speaker completions. The comparison of L1 and L2 speakers' preferences for the *Other* argument types revealed some effects of biasing contexts. While L1 speakers used them a lot more frequently than L2 speakers did out of context (in Experiment 1), these apparent differences faded in the presence of context sentences.

All these findings provide further evidence for the constraining effects of biasing contexts. As opposed to the dominance of DO arguments in corpora and the sentence continuations out of context, SCs far outnumbered DO arguments in both L1 (66% SCs and 26% DOs) and L2 speaker (73% SCs and 21% DOs) continuations in the SC-biasing context condition. The same effect manifested itself in DO-biasing context condition by leading participants to use DO arguments in almost 90% of L1 speakers' continuations (89% DOs and 6% SCs). Likewise, L2 speakers used DOs and SCs in 84% and 8% of their sentences, respectively.

The stronger sense and SF link in the DO-context condition was evident, substantiating the argument that DO-biased verb senses do not allow the frequent use of SC complements (*L1 speakers:Exp.1:* 0,2% vs. *Exp.2:* 6% in; *L2 speakers*: *Exp.1:* 1,5% vs. *Exp.2:* 8,4%).

When the differences were examined in the proportions of incorrect continuations of L2 speakers in the absence and presence of biasing contexts, only a marginal increase was found (7% in Exp. 1 and 9% in Exp. 2), contradicting Uçkun's (2012) finding that the percentage of erroneous sentences increased in the presence of context sentences. The findings of the present study do not back up her claim that the lack of freedom due to the constraints contexts imposed on participants led to more frequent grammar mistakes. In contrast, the syntactic and semantic clues provided by biasing contexts might have helped participants remember the less frequently used senses of some verbs that would not have been otherwise recalled. Also, the information available in the biasing contexts might have eliminated the need for coming up with totally new ideas, which might have facilitated the completion of the fragments.

In sum, the findings of these two experiments provided new evidence to corroborate the claim that the syntactic properties of the argument structures of a verb are contingent upon the semantic properties of verbs. In this respect, the findings of the present study provide support for the previous studies looking into the interdependence between verb sense and SFs both in theoretical linguistics (Green, 1974; Pinker, 1989; Grimshaw, 1990; Fisher et al., 1991; Levin, 1993; Pesetsky, 1995; Argaman and Roland, 2001; Roland and Jurafsky, 2002; Pearlmutter, 2002) and in psycholinguistics (Fisher, Gleitman and Gleitman, 1991; Boland, 1997; Hare et al., 2003; 2004).

As to the question of whether L2 speakers, especially the ones learning an L2 after the onset of puberty, can attain native-like syntax, the current study gave further scientific evidence for the lack of native-like grammatical knowledge even in proficient L2ers as in many previous studies (White and Genesee, 1996; White, Valenzuela, Kozlowska, Leung, 2004; also see White, 2003, for a review). The claim that L2 acquirers with high proficiency levels can put in performances within range of native speakers (e.g. Birdsong, 1992; White and Genesee, 1996; Bongaerts, 1999; Moyer, 1999) was in sharp contrast to the findings of the present study. Even though L2 English speakers' verb sense and subcategorization preferences were similar to those of L1 speakers and both of these groups displayed sensitivity to the presence of biasing contexts, the quantitative differences between them signaled L2 learners' incapability of reaching native-like attainment.

As the main focus of the present research is on the acquisition of the target structures by L2 English speakers, it is vital to evaluate its findings within the theoretical framework of SLA. Lack of native-like performance in proficient L2 speakers urge us to seek explanations about its possible reasons. The differences observed in the current study can be explained by Selinker's (1972) concept of *interlanguage,* which is a linguistic system exclusive to L2 learners. This is because L2 speakers followed patterns similar to L1 speakers' but with some differences. As environmental data is considered to be used in the building of interlanguage, the role of instruction or self-directed learning can account for the dissimilarities between the two groups of participants.

Considering that L2 speakers' preferences and use of discourse cues are analogous to L1 speakers', it is possible to say that verb subcategorization information has a share in the grammatical competence in L2; however, L1 speakers' knowledge seems to be more refined, which might have resulted in the inter-group differences in the language production tasks. This begs the question whether these differences were due to the lack of complete SF knowledge or a disconnect between the competence and performance of L2 learners. The L2 participants learned English in the instructional settings and they may have limited exposure to the target language outside the classrooms, if they do. This could have hindered L2 speakers who failed to perform in exactly the same way as L1 speakers. However, L2 speakers' poorer performance or maybe *reduced awareness* could also be related to their inability to use the grammatical knowledge they already had. When considered from this point of view, the *Adaptive Control of Thought Model* (Anderson, 1990) may shed some light on the processes observed. The model stipulates that learning begins with a declarative stage at which learners gather and store the relevant information. Then follows the associative (procedural) stage at which learners gain the ability to use this new knowledge in performing related tasks. The last stage that brings about fluency and thus probably native-like performance in L2 acquisition is the autonomous stage, which guarantees a more automatized language production. In the present case in which strong clues as to the existence and use of sense-contingent SF information are available, it can be argued that L2 speakers progressed from the declarative knowledge stage gained through instruction or reading to the procedural one because their sentence completions demonstrated they had some grammatical and lexical information about sense-contingent SFs. The reasons for the subtle differences between L1 and L2 speakers might have resulted from L2 groups' partial efficacy at the autonomous stage. As DeKeyser (2007, p. 4) pointed out, this could have hindered "the fully spontaneous, effortless, fast, and errorless use of that rule, often without being aware of it anymore". As they are still students, they can be expected to become more autonomous speakers as they are exposed to more input in the future.

From another perspective, plausible explanations for these differences between L1 and L2 speakers' performances can also be offered by the *Fundamental Difference Hypothesis* (FDH) formulated by Bley-Vroman (1990). FDH propounds that mechanisms active in L1 acquisition stop being available by a certain age. This theory, which is in intimate connection with the Critical Period Hypothesis (Lenneberg, 1967), claims that lack of direct access to the Universal Grammar severely hampers L2 acquisition and learners usually manage to end up with only a reasonable proficiency level. In brief, the fact that L1 speakers outperformed L2ers in the use of discourse context information and sense-contingent SFs could be associated with their age of onset and the availability or accessibility of UG principles in L2 acquisition.

Finally, a closer examination of L2 speakers' erroneous utterances held clues as to interlanguage and intralanguage factors. To illustrate, L2 learners had difficulty in distinguishing between the semantic and syntactic properties of verbs such as *accept, admit* and *agree* as a single verb in Turkish can roughly correspond to all these verbs. The effect of L1 transfer could also be observed in the use of *bet* because sentences such as "*He bet with his friend about the race"* were quite frequent. As these are not acceptable in English but possible in Turkish, they might have transferred their L1 SF knowledge while producing sentences in the L2. Additionally, they appear to have generalized their L2 SF knowledge in some instances. For example, in some incorrect L2 speaker continuations, the verb *recall* behaved like *remind* (e.g. *He recalled me of my old days*). Similarly, in some sentences, *expect* was substituted by *anticipate* and sentences like "*He anticipated Santa Claus to bring toy cars"* were produced. Finally, the presence of biasing contexts failed to block the influence of phonological similarities between some verbs (e.g. beg-bet and establish-publish). The confusion over the use of these verbs was also observed in Experiment 1. Last but not least, *that*-preferences of L2 speakers also deviated from native speakers'. That is, *that*-omission was not preferred by L2 speakers as often as it was by L1 speakers. These two groups' divergent preferences may be governed by the factors discussed in Section 4.5.

Whichever of these factors brought about the remarkable differences between the two groups of participants, the current study came up with results in line with the findings of several studies revealing L2 grammars' systematic divergence from L1 grammars (e.g. Coppieters, 1987; Bley-Vroman et al., 1988; Johnson and Newport, 1991; Sorace, 1993). The potential factors that caused this discrepancy between L1 and L2 speakers discussed briefly above can be investigated in detail in future studies.

4.6. Results of Experiment 3

In Experiment 3, four different reading time measures (*dwell time, first run dwell time, regressions-out* and *regression path duration*) in the pre-critical (ambiguous) and critical (disambiguating) regions of the target sentences were analyzed with three fixed effect factors (*ambiguity, context* and *group*) and their interaction as well as two random effects (*subject* and *item -verb*). These pre-critical and critical regions in the set of stimuli created for the verb *find* are illustrated in Table 4.15.

Table 4.15. *Pre-critical and critical regions in the stimulus for the verb FIND (experiment 3)*

DO-sense biasing context:	The police were searching for a suspect in connection with a murder, and yesterday they picked up his trail.
Target sentence:	They found /*the man* / *killed his wife and two sons,* *PRE-CRITICAL (ambiguous)* *CRITICAL (disambiguating)* / and then fled to Mexico to avoid arrest.
Unambiguous control sentence:	They found / (that) / the man / killed his wife and two sons, / and then fled to Mexico to avoid arrest.
SC-sense biasing context:	Dan first seemed like a good candidate to tutor Anna, but then, her parents learned about his troubled past.
Target sentence:	They found /*the man* / *killed his wife and two sons,* *PRE-CRITICAL (ambiguous)* *CRITICAL (disambiguating)* / and so they decided to hire another tutor.
Unambiguous control sentence:	They found / (that) / the man / killed his wife and two sons,/ and so they decided to hire another tutor.

As can be seen above, pre-critical regions contained ambiguous NPs following the target verbs and acting as the subjects of sentential complements, while critical regions, also called the disambiguating regions, included VPs denoting the actions in the embedded clauses.

Prior to the analyses, values shorter than 80 ms were discarded as it was quite unlikely to read the areas of interest in the target sentences in such a short time. Then, outliers - defined as values that are so distant from others in the dataset that they have probably been generated by different mechanisms (Hawkins, 1980) - were discarded. Supposing that experimental or measurement errors might have caused these deviations, they were identified using the quartile method. As suggested by Miller (1991) among others, the outlier value was chosen to be 2.5 standard deviations around the mean and the percentages of the missing values after elimination were calculated for each of the reading time measures in two areas of interest. For all models, the degrees of freedom were computed using the Satterthwaite approximation available via the R package lmerTest (Kuznetsova, Brockhoff and Christensen, 2014). Also, p values were adjusted based on the Tukey method designed to compare a family of eight estimates.

4.6.1. Reading time measures in the pre-critical (ambiguous) region

As mentioned above, GLMM methods were applied using the four reading time measures computed for the two distinct areas in the target sentences. All mean reading times for the pre-critical regions provided by the sixty-three L1 speakers and forty-seven L2 speakers are shown in Table 4.16. Also, Table 4.17 presents the results of the application of the GLMM.

Table 4.16. *Descriptive statistics of four reading time measures in the pre-critical region (experiment 3)*

	CONDITION	PRE-CRITICAL REGION							
		First - Run Dwell Time		***Regressions-Out***		***Regression Path Duration***		***Dwell Time***	
		M	*SE*	*M*	*SE*	*M*	*SE*	*M*	*SE*
L1 Speakers	DO-biasing Context - Ambiguous	253.92	6.55	0.329	0.020	520.07	15.07	439.18	10.52
	DO-biasing Context - Unambiguous	283.86	5.94	0.224	0.017	413.33	9.83	380.86	8.00
	SC-biasing Context - Ambiguous	275.73	6.60	0.250	0.018	462.24	12.92	402.78	9.19
	SC-biasing Context - Unambiguous	284.87	9.08	0.209	0.017	420.57	10.96	373.55	8.35
L2 Speakers	DO-biasing Context - Ambiguous	348.60	9.03	0.192	0.018	520.80	15.82	600.81	17.20
	DO-biasing Context - Unambiguous	382.37	9.20	0.123	0.015	505.52	18.64	537.72	15.43
	SC-biasing Context - Ambiguous	364.80	10.11	0.191	0.018	534.72	16.80	630.88	18.92
	SC-biasing Context - Unambiguous	361.87	9.08	0.129	0.015	470.14	13.64	517.64	14.52

Table 4.17. *Inferential statistics (generalized linear mixed-effects model) of four reading time measures in the pre-critical region (experiment 3)*

	First-Run Dwell Time			Regressions-Out			Regression Path Duration			Dwell Time		
	β (SE)	***t***	***p***	**β (SE)**	***z***	***p***	**β (SE)**	***t***	***p***	**β (SE)**	***t***	***p***
Intercept	5.703 (0.063)	90.497	***	-1.618 (0.204)	-7.917	***	6.074 (0.082)	73.631	***	6.234 (0.082)	75.622	***
Ambiguity	0.113 (0.036)	3.113	**	-0.571 (0.191)	-2.991	**	-0.060 (0.032)	-1.833	.	-0.115 (0.034)	-3.327	**
Biasing Context	0.029 (0.034)	0.855		-0.013 (0.176)	-0.076		0.016 (0.034)	0.465		0.034 (0.035)	0.961	
Group	-0.360 (0.052)	-6.894	***	0.829 (0.238)	3.478	***	-0.038 (0.064)	-0.596		-0.300 (0.055)	-5.371	***
Ambiguity * Biasing Context	-0.092 (0.047)	-1.930	.	0.020 (0.268)	0.077		-0.052 (0.046)	-1.131		-0.072 (0.046)	-1.561	
Ambiguity * Group	0.065 (0.062)	1.040		-0.069 (0.303)	-0.229		-0.125 (0.071)	-1.742	.	-0.017 (0.062)	-0.287	
Biasing Context * Group	0.095 (0.062)	1.528		-0.476 (0.292)	-1.628		-0.110 (0.071)	-1.533		-0.107 (0.062)	-1.731	.
Ambiguity * Biasing Context * Group	-0.042 (0.106)	-0.401		0.311 (0.505)	0.616		0.160 (0.128)	1.244		0.141 (0.107)	1.311	

Significance codes: '***'0.001, '**'0.01, '*'0.05, '.'0.1, ' '1

First-Run Dwell Time: Prior to the computation of the first-pass dwell time measures in the pre-critical region, outliers were eliminated, which led to a data loss of 2.68%.

Average means of first-run dwell times including initial fixations, regressions and re-fixations in this region demonstrated that L1 English speakers spent less time on the ambiguous regions of target sentences than L2 speakers did. It is obvious that neither context type nor ambiguity had an apparent effect on this. Results from linear mixed-effects model showed a reliable main effect of *group* on first-run dwell times in the pre-critical regions of sentences that lack complementizers (β = -0.360, SE = 0.052, t = -6.894), with first-pass times ~95 ms slower in L2 speakers following DO-biasing contexts. Similarly, the difference between these two groups was ~89 ms when SC-biasing contexts were provided. L1 speakers were also found to be faster in processing the ambiguous NPs in the sentences including the complementizer and preceded by both DO-biasing and SC-biasing contexts, with differences of ~99 ms and ~77 ms, respectively.

Additionally, the results of pairwise comparisons verified the statistically significant differences between L1 and L2 speakers' first-run dwell times in the pre-critical regions, and these differences did not seem to be contingent upon ambiguity or context type. To put it in a different way, L1 speakers spent less first-run dwell times than L2 speakers in the pre-critical regions in ambiguous sentences preceded by both SC-biasing (β = 0.264 SE = 0.051, p <.0001) and DO-biasing (β = 0.360, SE = 0.052, p <.0001) contexts. In a similar way, L1 English speakers' first-run dwell times were shorter than L2 speakers' when reading unambiguous sentences following contexts intended to promote the SC- biased (β = 0.241, SE = 0.052, p = .0001) and DO-biased (β = 0.294, SE = 0.051, p <.0001) senses of the target verbs.

At a closer examination of the first-run dwell times for ambiguous and unambiguous sentences, L2 speakers' average first-run dwell times in unambiguous sentences were ~44 ms longer than their ambiguous counterparts in the DO-biasing context condition. In the SC-biasing context condition, this difference was ~3 ms, with unambiguous sentences taking slightly longer than ambiguous ones. For L1 English speakers, these differences were ~30 ms and ~9 ms following DO-biasing and SC-biasing contexts, respectively. Their first-run dwell times on this area of interest were also observed to be slowed when the complementizer was present. Inferential statistical analyses of the data confirmed that in both groups of participants, first-run dwell times in the ambiguous regions of the sentences including *that* were generally significantly slower compared to temporarily ambiguous sentences without complementizers, and this resulted in a reliable main effect of ambiguity in this particular region (β = 0.113, SE = 0.036, t = 3.113). Pairwise comparisons also indicated that ambiguity had a remarkable influence on both L2 speakers' (*Amb-DO * Unamb-DO*, β = -0.1137, SE = 0.0365, p = .03) and L1 speakers' (*Amb-DO * Unamb-DO*, β = -0.1792, SE = 0.0554, p = .027) first-run dwell times only when the target sentences were preceded by DO-biasing contexts, but not when the contexts biased readers towards the SC-senses (both *ps*> 0.05). Effects of ambiguity on L1 and L2 speakers' first-run dwell times in the pre-critical region are illustrated in Figure 4.1.

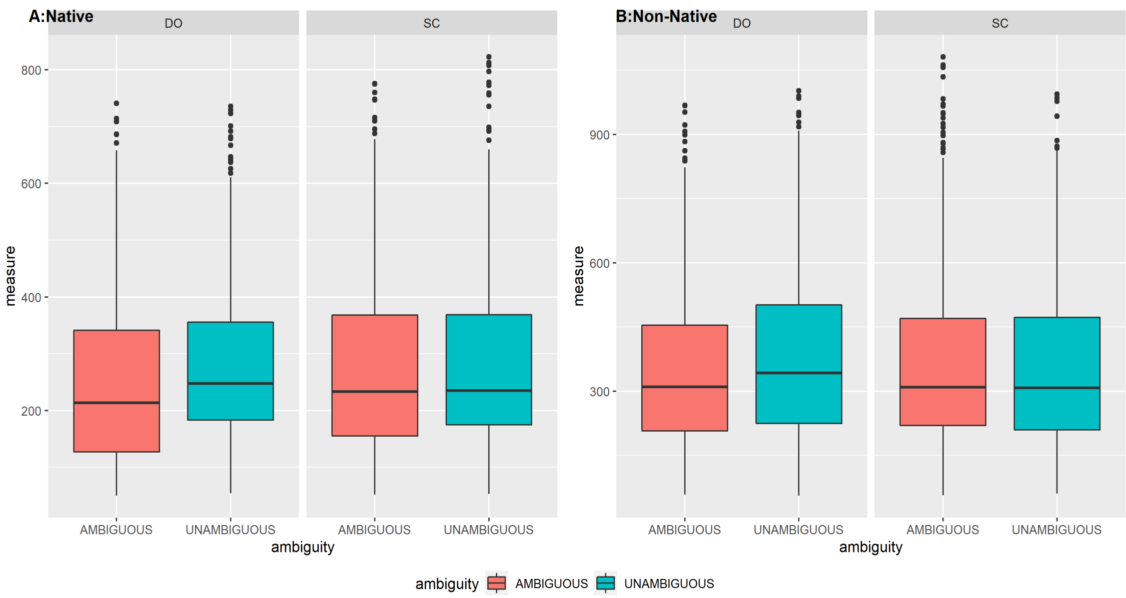

Figure 4.1. *Effects of ambiguity on L1 and L2 English speakers' first-run dwell times in the pre- critical region*

With respect to the influence of context types, L1 and L2 speakers displayed similar patterns in that the first-run dwell times of both groups in sentences without complementizers were longer when the given preceding contexts biased them towards the SC-senses. These differences between SC and DO-biasing contexts preceding ambiguous sentences were ~22 ms for L1 speakers and ~16 ms for L2 speakers. However, these differences between the two context types followed by both ambiguous and unambiguous sentences seem negligible and no reliable effect of biasing context on this reading time measure was found.

Taking the influence of ambiguity and context type into account, linear mixed-effects model results showed that even though the two-way interaction between these two variables was "marginally reliable" (β = -0.092, SE = 0.047, t = -1.930). This suggests that in both groups of participants, the average first-run dwell times in the pre-critical regions of unambiguous sentences following DO-biasing contexts were longer compared to sentences with complementizers or those preceded by SC-biasing contexts.

In sum, the effects of group and ambiguity were found to be statistically significant. In addition, the main effect of biasing contexts and other interactions seemed not to have a reliable effect on first-run reaction times, except for the interaction between ambiguity and biasing context approaching significance level (all other *t*s < 2).

Analyses performed separately for each group revealed that only the main effect of ambiguity was reliable in L2 English speaker data (β = 0.113, SE = 0.046, t = 2.431), whereas biasing context had no statistically significant effect. The interaction between ambiguity and biasing context only approached significance (β = -0.093, SE = 0.048, t = -1.924), indicating that L2 speakers had slowed first-run dwell times in the pre-critical regions when the complementizer was present, especially in sentences following DO-biasing contexts. In L1 English speaker group; however, reliable main effects of ambiguity (β = 0.178, SE = 0.058, t = 3.046) and context (β = 0.124, SE = 0.060, t = 2.059) were found, though their interaction failed to reach significance. This revealed that first-run dwell times on the ambiguous NPs were longer when these sentences included the complementizer. Furthermore, in cases where the context sentences promoted the SC-biased senses, readers' first-run dwell times increased compared to the DO-biasing context condition. The results of split analyses in the pre-critical region are presented in Table 4.18.

Table 4.18. *Inferential statistics (generalized linear mixed-effects model) of split analyses for four reading time measures in the pre-critical region (experiment 3)*

		First-Run Dwell Time			**Regressions-Out**			**Regression Path Duration**			**Dwell Time**		
		B (SE)	***t***	***p***	**B (SE)**	***z***	***p***	**B (SE)**	***t***	***p***	**B (SE)**	***t***	***p***
L1 Speakers	***Intercept***	5.344 (0.058)	91.627	***	-0.814 (0.221)	-3.678	***	6.038 (0.074)	81.526	***	5.935 (0.075)	78.167	***
	Ambiguity	0.178 (0.058)	3.046	**	-0.657 (0.281)	-2.332	*	-0.185 (0.068)	-2.696	**	-0.134 (0.058)	-2.283	*
	Biasing Context	0.124 (0.060)	2.059	*	-0.505 (0.282)	-1.790	.	-0.094 (0.070)	-1.353		-0.075 (0.057)	-1.302	
	Ambiguity * Biasing Context	-0.133 (0.105)	-1.263		0.328 (0.526)	0.624		0.106 (0.130)	0.812		0.069 (0.102)	0.677	
L2 Speakers	***Intercept***	5.704 (0.071)	79.904	***	-1.557 (0.180)	-8.620	***	6.075 (0.075)	80.349	***	6.233 (0.074)	83.993	***
	Ambiguity	0.113 (0.046)	2.431	*	-0.562 (0.189)	-2.968	**	-0.060 (0.032)	-1.856	.	-0.115 (0.033)	-3.421	***
	Biasing Context	0.026 (0.035)	0.750		-0.027 (0.179)	-0.154		0.014 (0.033)	0.429		0.033 (0.039)	0.856	
	Ambiguity * Biasing Context	-0.093 (0.048)	-1.924	.	0.032 (0.266)	0.121		-0.050 (0.046)	-1.091		-0.072 (0.048)	-1.499	

Regressions - Out: The second measure computed for the pre-critical areas was regressions-out, which refers to the number of saccades moving back while reading the target areas of the text. Means and standard deviations of the regressions-out in the pre-critical regions are reported in Table 4.16 above.

When the two groups of participants were compared in terms of their regressions out of the pre-critical region, it is evident that L1 English speakers made more regressive eye movements than L2 speakers irrespective of ambiguity and context type. The higher number of regressive eye movements in L1 speakers suggested that they were garden-pathed more strongly than the L2 group. In parallel with these conclusions drawn from the descriptive statistics, linear mixed-effects model results revealed a reliable main effect of *group* on the number of regressions-out ($\beta = 0.829$, SE = 0.238, $t = 3.478$). Pairwise comparisons also indicated that while reading ambiguous sentences following DO-biasing contexts, L1 speakers made considerably more regressions than L2 speakers (32% vs. 19%), which resulted in a statistically significant difference ($\beta = -0.829$, SE = 0.238, $p = .011$).

As to the influence of ambiguity, it can clearly be seen that irrespective of the context type, regressions were more frequent in both groups when the sentences lacked the complementizer than when *that* was present. For ambiguous sentences preceded by both SC-biasing and DO-biasing contexts, almost 19% of first-pass readings of L2 English speakers ended with a regression out of the pre-critical region, while the percentage of regressions in their unambiguous counterparts was 12%. The percentages of L1 speakers' regressive eye movements in ambiguous and unambiguous sentences in the DO-biasing context condition were 32% and 22%, respectively. Similarly, they were 25% in ambiguous sentences and 20% in unambiguous ones preceded by SC-biasing contexts. All these descriptive statistics brought about a statistically significant main effect of ambiguity on the number of regressions-out ($\beta = -0.571$, SE = 0.191, $t = -2.991$). Pairwise comparisons also demonstrated that the overall reliable ambiguity effect was largely a consequence of the difference in L2 English speakers' frequent regressions while reading the ambiguous sentences following DO-biasing contexts compared to their unambiguous versions and this difference seems marginally reliable ($\beta = 0.571$, SE = 0.191, $p = .056$). None of the other planned comparisons centered around ambiguity approached significance level.

Lastly, when context types are taken into consideration, as observed in Table 4.16, the numbers of regressions made by L2 English speakers were almost identical in ambiguous sentences following SC-biasing and DO-biasing contexts (approximately 19% in both). In unambiguous sentences including *that*, they also made equal numbers of regressive eye movements in both context type conditions (12% in both SC-biasing and DO-biasing context conditions). This indicates that the verb sense promoted in the context sentences made almost no difference in L2 speakers' regressions out of the ambiguous region. However, L1 speakers displayed a dissimilar pattern making more regressions out of this region when the sentences were ambiguous and were preceded by DO-biasing contexts compared to when they followed SC-biasing ones (32% and 25%, respectively). Their regressions were also slightly more frequent following DO-biasing contexts when the complementizer was present (22% in DO-biasing condition and 20% in SC-biasing one). However, these differences were not robust enough to produce a statistically significant effect of context type on the regressions out of this particular area.

Moreover, no two-way or three-way interactions appeared to reach reliability (all other ts < 1.628) although biasing context * group interaction somewhat approached it ($\beta = -0.476$, $SE = 0.292$, $t = -1.628$). This resulted from the fact that the biggest discrepancy between the numbers of regressions made by L1 and L2 English speakers in the pre-critical region was observed in ambiguous sentences preceded by DO-biasing contexts. This suggests that L1 speakers regressed out of this region more frequently than L2 speakers did in ambiguous sentences preceded by DO-biasing contexts.

In brief, group and ambiguity variables - but not biasing context- were found to have statistically significant effects on comprehenders' regressions out of the pre-critical region, though no reliable interaction was found between these variables. Only the interaction between group and context approached significance to a degree.

Group-specific analyses showed that only the frequent regressions out of the ambiguous region in sentences lacking the complementizer yielded a reliable main effect of ambiguity in L2 English speakers' data ($\beta = -0.562$, $SE = 0.189$, $z = -2.968$). In other words, they regressed out of this region more frequently when the complementizer was absent. On the other hand, in L1 English speaker data, the main effect of ambiguity was fully significant ($\beta = -0.657$, $SE = 0.281$, $z = -2.332$), while context type was marginally reliable ($\beta = -0.505$, $SE = 0.282$, $z = -1.790$). This indicated that L1 speakers made a lot more regressive eye movements when there was a mismatch between the context type and the syntactic structures following the target verbs. However, the interaction between the two variables did not approach significance.

Regression Path Duration: The elimination of outliers from the regression path duration resulted in a data loss of 1,9%. This measure including the regressions back to the previous areas of interest is expected to provide insight into readers' syntactic and semantic integration patterns during sentence processing.

An analysis of the regression path durations on the ambiguous region showed that they were longer in L2 speaker data except for the ambiguous/DO-biasing context condition. Only in this condition were the regression path durations of L1 and L2 English speakers were approximately the same. Despite these differences, regression path durations on this temporarily ambiguous region did not show any reliable effects of *group*.

The descriptive statistics showed that regression path durations on the pre-critical region were shorter in sentences including *that* compared to the ambiguous versions, though the difference only produced a marginally reliable main effect of ambiguity (β = -0.060, SE = 0.032, t = -1.833). The ambiguity effect, as shown by pairwise comparisons, was largely due to L2 speakers' longer regression path durations in the ambiguous sentences preceded by SC-biasing contexts (β = 0.112, SE = 0.033, p = .017). It is also worth mentioning that the ~107 ms difference between the regression path durations of ambiguous and unambiguous sentences preceded by DO-biasing contexts in L1 speaker data seem to have approached significance (β = 0.185, SE = 0.064, p = .078). Split analyses revealed that the effect of ambiguity was fully reliable in L1 speakers (β = -0.185, SE = 0.068, t = -2.696). This ambiguity effect in sentences preceded by DO-biasing contexts was ~107 ms, while it was only ~42 ms in the SC-biasing context condition. On the other hand, ambiguity had a marginal effect in L2 speaker data (β = -0.060, SE = 0.032, t = -1.856), with a difference of ~15 ms when the sentences were preceded by DO-biasing contexts and ~64 ms in SC-biasing context conditions. Figure 4.2 illustrates the influence of ambiguity on both groups of participants' regression path durations in the ambiguous region.

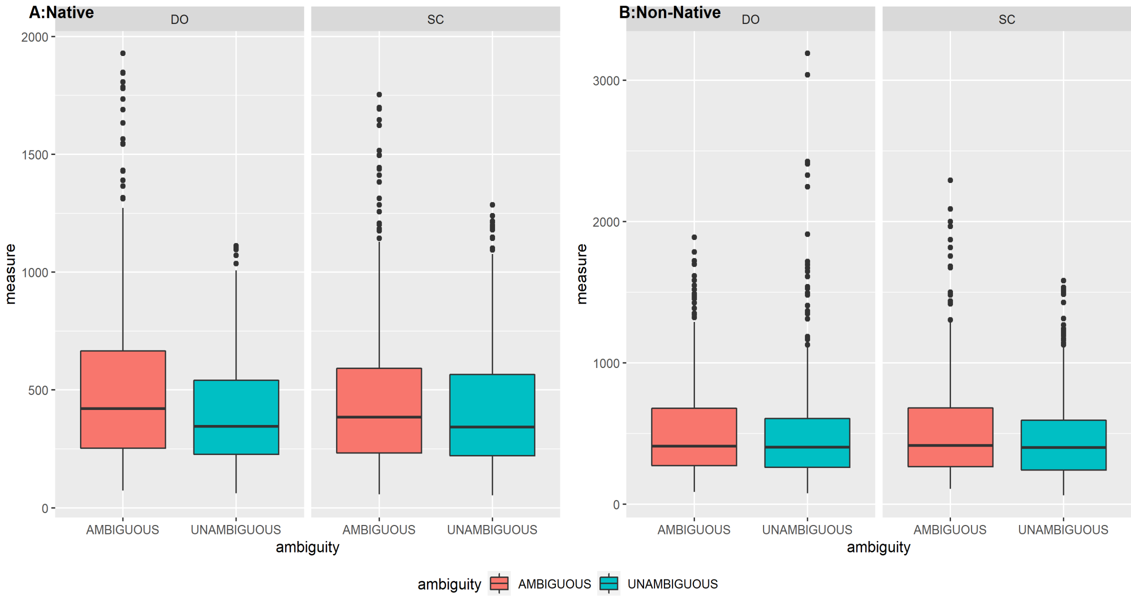

Figure 4.2. *Effects of ambiguity on L1 and L2 English speakers' regression path durations in the pre- critical region*

A marginally significant interaction was detected between the variables of group and ambiguity (β = -0.125, SE = 0.071, t = -1.742), indicating that longer regression path durations of L2 speakers became more noticeable when the complementizer was absent.

As for the effect of context type, means of regression path durations showed that L1 and L2 speakers displayed entirely different patterns. As a result, no reliable main effect of biasing context arose in this region. The remaining two and three-way interactions could not reach significance level, either. Likewise, none of the pairwise comparisons were statistically significant.

In short, although it is obvious that there exist some quantitative differences between the regression path durations of two groups of participants on the ambiguous regions of sentences preceded by different context types, only ambiguity produced a marginally reliable effect. This resulted from the fully reliable effect of ambiguity in L1 speaker data and a marginally reliable one in L2 speaker data. The rest of the results of split analyses were consistent with those of the overall analyses, with no reliable effect of biasing context and no ambiguity*biasing context interaction.

Dwell Time: In the analysis of the dwell time measures in the pre-critical area, the outlier value was set to 2.5 and there was a 2.9% of data loss after the elimination of outliers. Average dwell times of the participants are provided in Table 4.16.

Means that can be observed in the table revealed that L2 English speakers' dwell times in the pre-critical region were longer compared to L1 speakers regardless of ambiguity and context type. This resulted in a statistically significant main effect of *group* (β = -0.300, SE = 0.055, t = -5.371). In a similar manner, pairwise comparisons performed so as to better see the two-way interactions also confirmed this finding, revealing significant differences between the dwell times of L1 and L2 speakers in sentences following both context types. The difference between the two groups' reading times of ambiguous (complementizer absent) and unambiguous (complementizer present) sentences also turned out to be statistically significant in both context types. To be more precise, L2 speakers' dwell times in the pre-critical regions of sentences without the complementizer *that* were slowed following both SC-biasing (β = 0.407, SE = 0.054, p <.0001) and DO-biasing (β = 0.300, SE = 0.055, p <.0001) contexts more considerably compared to those of L1 speakers, and these differences both reached the significance level. Likewise, it took L2 English speakers longer than L1 speakers to process the pre-critical regions of unambiguous sentences following both SC-biasing (β = 0.284, SE = 0.055, p <.0001) and DO-biasing (β = 0.318, SE = 0.055, p <.0001) contexts.

Having discovered whether comprehenders read the target sentences in their L1 or in an L2 had a great impact on their reaction times, a comparison of the reading times for ambiguous and unambiguous sentences were also drawn. These comparisons demonstrated that dwell times were longer in the ambiguous region when the complementizer *that* was absent than when it was present, suggesting that the processing of ambiguous sentences could be more time-consuming than that of their unambiguous versions. The fact that dwell times were longer regardless of the context type testified that the garden-path effect could not be blocked by the biasing contexts provided. As can be seen in Table 4.17, these differences led to a reliable ambiguity effect (β = -0.115, SE = 0.034, t = -3.327). As a result of the pairwise comparisons, differences in the dwell times of L2 English speakers on the pre-critical regions of ambiguous and unambiguous sentential complement continuations were found to be significant for both SC-biasing (β = 0.188, SE = 0.031, p <.01) and DO-biasing contexts (β = 0.115, SE = 0.034, p = .019). However, ambiguity was found to have no such an effect on L1 speakers' dwell times on the ambiguous region ($p > 0.05$). Effects of ambiguity on L1 and L2 speakers' dwell times in the pre-critical region are illustrated in Figure 4.3.

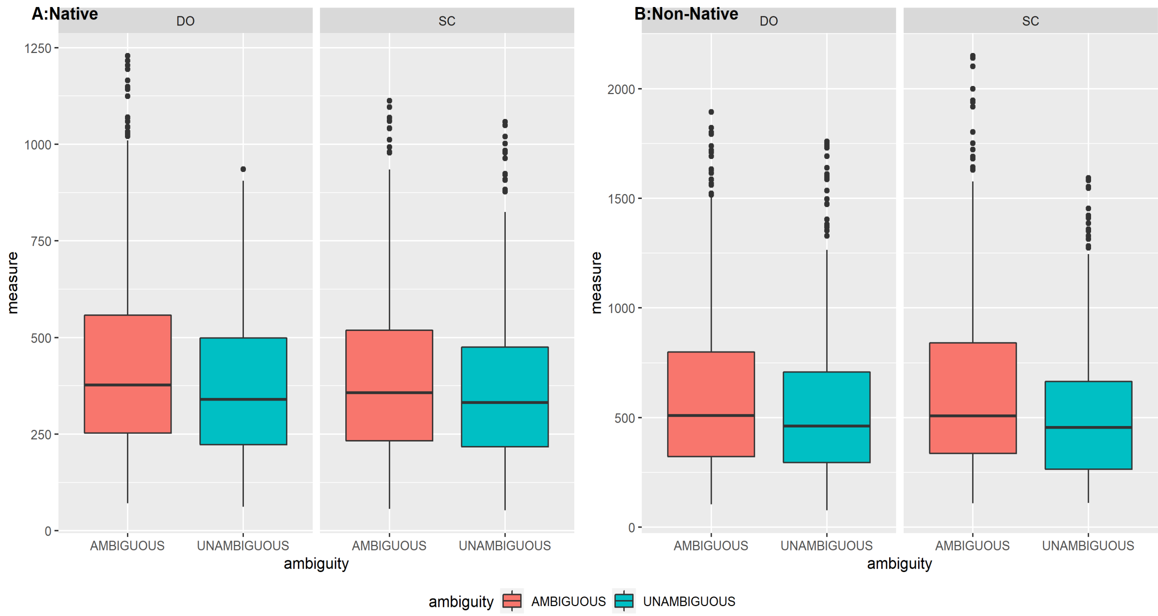

Figure 4.3. *Effects of ambiguity on L1 and L2 English speakers' dwell times in the pre-critical region*

As for the effect of biasing contexts, it took L1 speakers ~37 ms longer to read the ambiguous sentences following DO-biasing contexts than those following SC-biasing ones. This difference resulting from context type was only ~7 ms in sentences including *that*. On the other hand, L2 speakers patterned differently from L1 speakers in that dwell times in the pre-critical regions of ambiguous sentences preceded by SC-biasing contexts were ~30 ms longer than those following DO-biasing contexts. In the reading of unambiguous sentences; however, they displayed similarities to L1 speakers, spending ~20 ms more reading sentences preceded by DO-biasing contexts. The results of the mixed-effects model displayed no significant effects of biasing context in the pre-critical region ($\beta = 0.034$, $SE = 0.035$, $t = 0.961$) and this finding was also confirmed by pairwise comparisons (all *p*s > .05).

In brief, dwell times in the pre-critical region including ambiguous NPs showed there was a main effect of *group* and *ambiguity* (but not biasing context), while the two and three-way interactions between these factors did not reach significance (all other *t*s < 1.74). Nevertheless, the two-way interaction between biasing context and group seemed to be close to the significance level ($\beta = -0.107$, $SE = 0.062$, $t = -1.731$), indicating that it took L2 speakers longer to read the pre-critical regions of sentences following SC-biasing contexts, whereas L1 speakers spent more time reading the ambiguous NPs when the sentences were preceded by DO-biasing contexts.

The split analyses performed also demonstrated that in L1 speakers, the main effect of ambiguity was reliable (β = -0.134, SE = 0.058, t = -2.283), while biasing contexts had no significant influence on this reading time measure, and the interaction did not reach significance. Likewise, ambiguity was found to be the only variable with a reliable effect on L2 speakers' dwell time on the ambiguous region (β = -0.115, SE = 0.033, t = -3.421). This suggested that discourse context information had no significant effect on readers' parsing decisions in the pre-critical region. One of the most remarkable findings consistent within both groups of participants was that regardless of context type, it took comprehenders longer to read this region when the complementizer was absent. The results of split analyses in the pre-critical region are presented in Table 4.18.

4.6.2. Reading time measures in the critical (disambiguating) region

All statistical analyses were conducted using the descriptive statistics of the four different reading time measures in the critical region. The average means and standard errors are presented in Table 4.19 and the results of linear mixed-effects models are also provided in Table 4.20.

Table 4.19. *Descriptive statistics of four reading time measures in the critical region (experiment 3)*

	CONDITION	CRITICAL REGION							
		First-Run Dwell Time		***Regressions-Out***		***Regression Path Duration***		***Dwell Time***	
		M	***SE***	***M***	***SE***	***M***	***SE***	***M***	***SE***
L1 Speakers	DO-biasing Context - Ambiguous	544.04	12.25916	0.1348	0.0147938	686.56	18.16332	700.82	16.17978
	DO-biasing Context - Unambiguous	532.32	10.95933	0.0953	0.0124652	614.96	13.38443	642.50	12.67094
	SC-biasing Context - Ambiguous	507.78	10.53184	0.1359	0.0145094	648.07	16.25972	624.57	13.58438
	SC-biasing Context - Unambiguous	517.21	11.16959	0.0853	0.0120454	604.33	14.02513	609.37	13.53137
L2 Speakers	DO-biasing Context - Ambiguous	668.04	15.59534	0.1698	0.0174339	921.37	27.25736	1057.12	29.18144
	DO-biasing Context - Unambiguous	663.11	16.24598	0.0804	0.0126942	764.17	19.93899	855.43	22.39931
	SC-biasing Context - Ambiguous	664.69	15.65399	0.1569	0.0168885	837.54	21.21167	978.72	24.27048
	SC-biasing Context - Unambiguous	661.61	15.21605	0.1047	0.0141677	773.19	20.17918	851.33	21.42662

Table 4.20. *Inferential statistics (linear mixed-effects model) of four reading time measures in the critical region (experiment 3)*

	Dwell Time			**First-Run Dwell Time**			**Regressions-Out**			**Regression Path Duration**		
	B (SE)	***T***	***P***	**B (SE)**	***T***	***P***	**B (SE)**	***T***	***P***	**B (SE)**	***T***	***p***
Intercept	6.804 (0.081)	83.155	***	6.361 (67,74)	93.913	***	-1.817 (0.220)	-8.253	***	6.658 (0.089)	74.400	***
Ambiguity	-0.193 (0.028)	-6.894	***	-8.277 (38,77)	-0.214		-0.908 (0.214)	-4.233	***	-0.171 (0.027)	-6.134	***
Biasing Context	-0.053 (0.036)	-1.463		0,1667 (38,37)	0.004		-0.056 (0.235)	-0.238		-0.057 (0.033)	-1.701	.
Group	-0.391 (0.063)	-6.156	***	-211,9 (66,16)	-3.204	**	-0.314 (0.232)	-1.352		-0.297 (0.062)	-4.761	***
Ambiguity * Biasing Context	0.055 (0.040)	1.366		5,816 (45,85)	0.127		0.408 (0.294)	1.388		0.0753 (0.0393)	1.915	.
Ambiguity * Group	.109 (0.070)	1.551		-13,05 (75,72)	-0.172		0.451 (0.323)	1.396		0.0928 (0.0703)	1.320	
Biasing Context * Group	-0.082 (0.070)	-1.165		-67,58 (75,77)	-0.892		0.058 (0.294)	0.198		0.0011 (0.0704)	0.016	
Ambiguity * Biasing Context * Group	0.014 (0.129)	0.112		41,19 (139,4)	0.296		-0.511 (0.494)	-1.034		-0.0545 (0.1304)	-0.418	

Significance codes: ‘***’0.001, ‘**’0.01, ‘*’0.05, ‘.’0.1, ‘ ’1

First-Run Dwell Time: Prior to the analysis of first-run dwell times in the critical region, there occurred a 2.49% of data loss after the elimination of outliers.

As can be seen in Table 4.19, means of first-run dwell times provided proof for the existence of considerable differences between L1 and L2 English speakers' processing patterns. L1 speakers' processing speed was higher overall than that of L2 speakers, which was not influenced by either context type or ambiguity. To be more precise, a reliable effect of group was found, with L2 English speakers spending ~124 ms longer on the disambiguating regions of ambiguous sentences following DO-biasing contexts. The difference was ~157 ms in ambiguous sentences preceded by SC-biasing contexts. In the critical regions of sentences including the complementizer; on the other hand, these differences between participant groups in sentences preceded by DO-biasing and SC-biasing contexts were found to be ~131 ms and ~144 ms, respectively (β = -211.9, SE = 66.16, t = -3.204).

In parallel with the overall statistical analyses, pairwise comparisons of first-run dwell times indicated that participants' native languages had a significant influence on the processing times of critical areas in ambiguous sentences preceded by both DO-biasing (β = 0.211, SE = 0.066, p = .02) and SC-biasing contexts (β = 0.279, SE = 0.065, p = .0005). Similar results were obtained as a result of the comparison of two groups reading the unambiguous versions of the sentences following DO-biasing (β = 0.225, SE = 0.065, p = .0125) and SC-biasing contexts (β = 0.251, SE = 0.065, p = .0034).

A direct comparison of the first-run dwell times in the critical regions of ambiguous and unambiguous sentences demonstrated that it generally took longer to read the sentences without complementizers compared to unambiguous ones irrespective of the verb sense promoted by the contexts. That is to say, in L2 English speakers' data, first-run dwell times in the critical regions of sentences including *that* were ~5 ms shorter following DO-biasing contexts and only ~3 ms shorter following SC-biasing contexts compared to those of ambiguous sentences. However, L1 English speakers displayed a somewhat different pattern with a slightly bigger difference between the first-run dwell times of ambiguous and unambiguous sentences (with differences of ~12 ms in DO-biasing context condition and ~10 ms in SC-biasing context condition). Not surprisingly, these slight differences did not result in a significant main effect of ambiguity in this region (p > .05).

Table 4.21. *Inferential statistics (generalized linear mixed-effects model) of split analyses for four reading time measures in the critical region (experiment 3)*

		First-Run Dwell Time			**Regressions-Out**			**Regression Path Duration**			**Dwell Time**		
		B (SE)	***T***	***P***	**B (SE)**	***T***	***P***	**B (SE)**	***Z***	***P***	**B (SE)**	***T***	***P***
L1 Speakers	***Intercept***	6.146 (0.076)	80.359	***	6.404 (0.087)	-8.228	***	6.358 (0.094)	67.231	***	6.404 (0.087)	73.553	***
	Ambiguity	-0.024 (0.081)	-0.303		-0.084 (0.077)	-1.836	.	-0.078 (0.070)	-1.103		-0.084 (0.077)	-1.081	
	Biasing Context	-0.071 (0.079)	-0.897		-0.133 (0.081)	0.103		-0.055 (0.073)	-0.751		-0.133 (0.081)	-1.648	.
	Ambiguity * Biasing Context	0.052 (0.153)	0.343		0.068 (0.149)	-0.267		0.019 (0.134)	0.148		0.068 (0.149)	0.459	
L2 Speakers	***Intercept***	6.359 (0.062)	101.528	***	6.804 (0.079)	-8.522	***	6.657 (0.088)	75.223	***	6.804 (0.079)	85.601	***
	Ambiguity	-0.005 (0.043)	-0.133		-0.193 (0.030)	-4.228	***	-0.171 (0.028)	-6.092	***	-0.193 (0.030)	-6.426	***
	Biasing Context	0.002 (0.044)	0.053		-0.053 (0.036)	-0.483		-0.057 (0.031)	-1.826	.	-0.053 (0.036)	-1.460	
	Ambiguity * Biasing Context	0.002 (0.049)	0.054		0.055 (0.042)	1.360		0.075 (0.039)	1.919	.	0.055 (0.042)	1.310	

As to the influence of discourse context information, its main effect overall was not reliable (β = 0.166, SE = 38.37, t = 0.004). Even though the reading times following DO-biasing contexts were longer than those following SC-biasing ones for both groups of participants in both ambiguity conditions, these negligible differences could not approach significance. Pairwise comparisons also validated the insignificant effect of discourse contexts on the first-run dwell times on this particular region. Figure 4.4 below illustrates how ambiguity and context type affect participants' first-run dwell times.

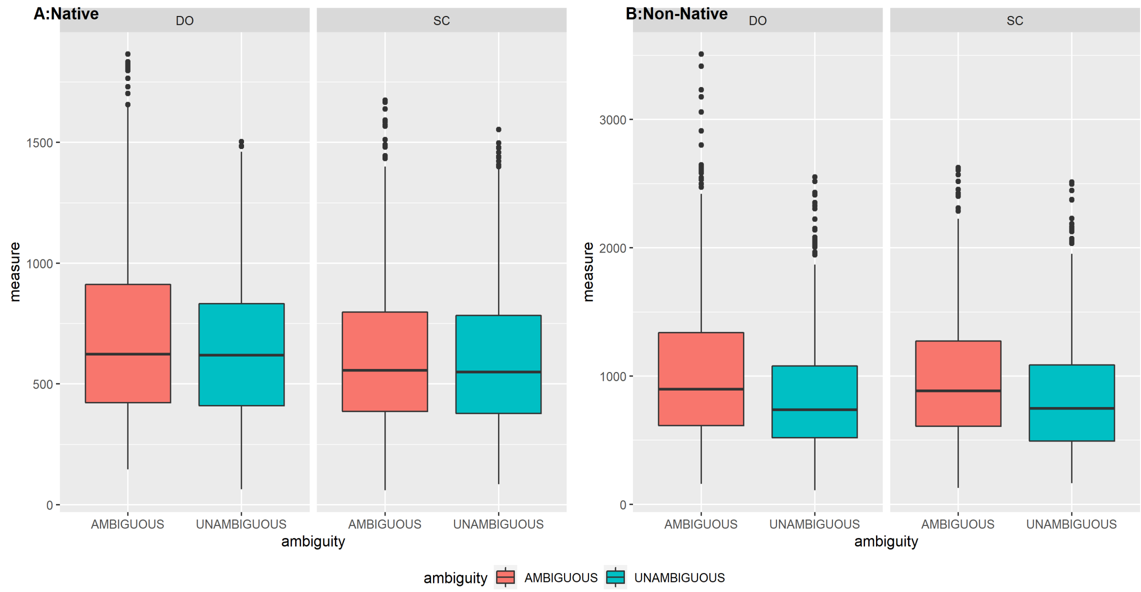

Figure 4.4. *Effects of ambiguity on L1 and L2 English speakers' first-run dwell times in the critical region*

In brief, when the first-run dwell times in the critical region is concerned, only a reliable main effect of *group* arose. Neither the main effects of ambiguity and biasing context nor the interactions between variables reached significance level (all other *t*s < 2). Apart from these, all pairwise comparisons centered around ambiguity and type of biasing contexts failed to approach reliability.

Split analyses were also in line with the results of the overall analyses, finding out no reliable effects of ambiguity or context type in both groups. This suggests that neither of these factors had a major influence on the construction of initial interpretations during processing regardless of whether the subjects were reading in their L1 or in an L2. The results of the split analyses are presented in Table 4.21.

Regressions-Out: The comparison of two groups of participants in terms of their regressions out of the critical region displayed that L2 speakers of English regressed out more than L1 speakers did in ambiguous sentences following SC-biasing (*L1 speakers:* 13%, *L2 speakers:* 15%) and DO-biasing contexts (*L1 speakers:* 13%, *L2 speakers:* 16%) as well as in unambiguous sentences preceded by SC-biasing contexts (*L1 speakers:* 8%, *L2 speakers:* 10%). However, while reading ambiguous sentences following DO-biasing contexts, L1 speakers seem to have made more regressive eye movements despite the seemingly slight difference between two groups (*L1 speakers:* 13%, *L2 speakers:* 16%). This suggests that the mismatch between the promoted verb sense and sentence continuation led to more frequent regressive saccades in L1 speakers. However, these slight differences between two groups of participants' regressions-out of the critical region failed to produce a reliable main effect of *group* ($\beta = -0.31481$, SE = 0.23290, t = -1.352).

Moreover, in both groups of participants, regressive eye movements were more frequent when *that* was absent than when it was present. More specifically, in both context types, the first-pass of L2 speakers of English on the disambiguation region seem to have ended with a regression when the target sentences were temporarily ambiguous (16% in *DO-biasing* condition and 15% in *SC-biasing* one). These percentages were 8% in unambiguous sentences following DO-biasing contexts and 10% in unambiguous ones following SC-biasing contexts. Inferential statistics also displayed that irrespective of context type and group, the number of participants' backward movements out of the critical region was influenced significantly by ambiguity ($\beta = -0.908$, SE = 0.214, t = -4.233). As a result of the pairwise comparisons drawn, it was discovered that L2 speakers' regressions in ambiguous sentences preceded by DO-biasing contexts were much higher than the ones in their unambiguous counterparts ($\beta = 0.908$, SE = 0.215, p = .0006). This comparison seems to be the only one reaching reliability level.

Taking context types into consideration, the differences in the numbers of regressions-out made by both groups of participants did not appear to be remarkable. Although there were some minor differences between sentences preceded by DO and SC-biasing contexts, they failed to lead to a crucial difference in inferential statistics ($\beta = -0.056$, SE = 0.235, t = -0.238). Also, no other reliable two and three-way interactions were found on this particular region (all other *t*s < 1.39).

In brief, the only significant main effect was related to ambiguity, suggesting that regardless of the context type, both groups of participants attempted to return and re-examine the previous regions of ambiguous sentences more frequently as stronger garden-path effects were observed in the critical area, especially when the complementizer was absent.

Separate analyses for each group revealed a reliable influence of ambiguity on L2 English speakers' regressions out of the critical region (β = -0.902, SE = 0.213, t = -4.228); whereas its effect in L1 speaker reading time data was only marginal (β = -0.456, SE = 0.248, t = -1.836). The effect of biasing context and the two-way interactions; however, failed to approach significance.

Regression path duration: In the analysis of this reading time measure that is considered to provide insight into higher order reading skills, approximately 2% of the data were lost after the outliers were eliminated.

Descriptive statistics indicated that regardless of ambiguity and context type, regression path durations of L2 English speakers in the critical region were longer than those of L1 speakers'. To exemplify, the difference between two participant groups' regression path durations following ambiguous sentences preceded by DO-biasing contexts was ~235 ms, while it was found to be ~189 ms following SC-biasing contexts. Similarly, regression path durations were longer in L2 speaker data when the sentences included complementizers. These discrepancies between the two participant groups, in turn, resulted in a reliable main effect of *group* (β = -0.297, SE = 0.062, t = -4.761). Pairwise comparisons also corroborated these results revealing that the differences in L1 and L2 speakers' datasets were statistically significant in ambiguous (β = 0.297, SE = 0.062, p = .0001) and unambiguous (β = 0.205, SE = 0.061, p = .0190) sentences following DO-biasing contexts, with longer regression path durations in L2 speakers. Likewise, these differences in ambiguous (β = 0.296, SE = 0.061, p < .0001) and unambiguous (β = 0.258, SE = 0.062, p = .0009) sentences preceded by SC-biasing contexts also reached significance level, with L2 speakers once again spending longer times to appropriately integrate the target words with the unfolding meaning in context.

Moreover, regression path durations on the disambiguating region were found to be shorter when *that* was present than when it was absent, resulting in a significant main effect of ambiguity (β = -0.171, SE = 0.027, t = -6.134). A closer look at the effect of ambiguity through pairwise comparisons indicated that differences in regression path durations in ambiguous and unambiguous sentences among L2 speakers of English were ~64 ms following SC-biasing contexts and ~157 ms when the target sentences were preceded by DO-biasing contexts. These differences produced a statistically significant effect of ambiguity in both SC-biasing (β = 0.096, SE = 0.026, p = .0084) and DO- biasing (β = 0.171, SE = 0.028, p < .0001) context conditions. As the descriptive statistics show, regression path durations in ambiguous sentences were a lot longer than those in unambiguous ones. As to these differences in L1 speakers' reading times, it was found out that they were not statistically significant in DO-biasing and SC-biasing conditions (both *ps* > 0.05). It is thus clear that only L2 speakers were sensitive to ambiguity when regression path durations in the critical region were concerned (β = -0.171, SE = 0.028, t = -6.092). This implied they had to put a greater effort into the syntactic and semantic integration of the new information into the unfolding sentence. Figure 4.5 below shows the effect of ambiguity and context type on the regression path durations of L1 and L2 English speakers in the critical region.

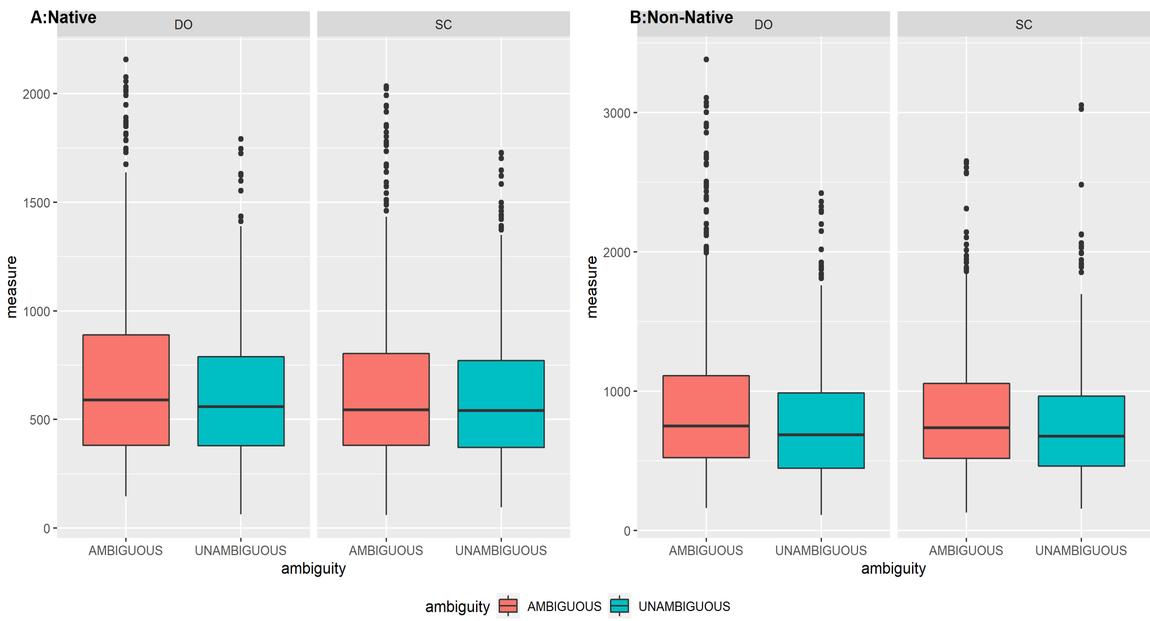

Figure 4.5. *Effects of ambiguity on L1 and L2 English speakers' regression path durations in the critical region*

Lastly, it could be observed that in both groups of participants, regression path durations in the critical regions were longer in ambiguous sentences following DO-biasing contexts compared to the sentences that biased readers towards the SC-senses (with a difference of ~38 ms in L1 speakers and ~84 ms in L2 speakers). Despite the overall longer regression path durations following DO-biasing contexts in both groups, these differences only produced a marginally reliable effect of biasing context on this reading time measure in the critical region (β = -0.057, SE = 0.033, t = -1.701). These findings suggested that the incompatibility between the sense-promoting biasing context and the SC continuation in the evolving sentence caused a more robust processing difficulty than it did when an SC followed an SC-biasing context. These two fully significant (group and ambiguity) and one marginally significant (biasing context) main effects generated a marginally reliable two-way interaction between ambiguity and biasing context (β = 0.075, SE = 0.039, t = 1.915). This meant that the regression path durations at disambiguation were the longest when the preceding contexts promoted the DO-biased verb senses and when *that* was absent in these sentences.

The results of split analyses; however, revealed that these reliable main effects and interactions were mainly due to the elevated regression path durations in L2 speaker dataset. That is to say, a fully significant effect of ambiguity (β = -0.171, SE = 0.028, t = -6.092) and a marginally significant effect of biasing context (β = -0.057, SE = 0.031, t = -1.826) arose in this region, resulting in a marginally significant ambiguity*biasing context interaction (β = 0.075, SE = 0.039, t = 1.919). Nevertheless, neither the main effects nor the interaction was reliable in L1 English speaker data. This showed that L2 speakers needed to go back and reread the previous regions of target sentences more often than L1 speakers did, indicating a relatively late processing and more cognitive effort.

Summing up all these findings, the influence of ambiguity and group was mostly reliable in almost all reading time measures on both areas of interest. The general tendency was to spend longer reading times and to make more frequent regressive eye movements when the sentences lacked the complementizer. To add to that, L2 speakers turned out to be slower at reading and comprehending the target sentences compared to L1 English speakers. The overall analyses also indicated that discourse context information had no statistically significant effects on reading times, except for its marginal effect on the regression path durations in the critical region. The results of split analyses also bore some resemblance to those obtained as a result of overall analyses. For instance, both groups of participants were affected by ambiguity in the pre-critical region in the unexpected direction; however, this effect did not persist in L1 speakers in the critical region, whereas it was reversed in L2 speaker data. L1 and L2 speakers showed a striking dissimilarity in their use of discourse context information. While context type was found to have a marginally reliable effect on L1 speakers' dwell times in the critical region, its effect was merely reflected in the regression path durations of L2 speakers. This marginal effect on the regression path durations in the critical region managed to generate a reliable ambiguity*biasing context interaction in the L2 speaker group.

Dwell Time: Based on the predetermined criteria, outliers were eliminated, and the eventual dwell time data loss was 2.5%.

The descriptive statistics indicate that L2 speakers of English had more elevated dwell times in the critical areas of the target sentences compared to L1 speakers. The variables biasing context and ambiguity seem to have had no major effect on this pattern. To illustrate, there was a difference of ~357 ms between L1 and L2 speakers' dwell times in ambiguous sentences following DO-biasing contexts. Similarly, it took L2 speakers ~354 ms longer than L1 speakers to read the critical regions of ambiguous sentences preceded by SC-biasing contexts. Moreover, the differences between the two groups in sentences including the complementizer were also ~213 ms and ~242 ms respectively when the sentences were preceded by DO-biasing and SC-biasing contexts. That is to say, dwell times were considerably longer overall among L2 speakers, resulting in a reliable main effect of *group* ($\beta = -0.391$, $SE = 0.063$, $t = -6.165$). Pairwise comparisons also confirmed that participants' native languages seemed to lie at the root of some marked differences. They showed that L2 speakers' dwell times were longer than L1 speakers' in ambiguous sentences following both SC-biasing ($\beta = 0.473$, $SE = 0.062$, $p < .0001$) and DO-biasing ($\beta = 0.391$, $SE = 0.063$, $p < .0001$) contexts and these differences reached significance. Statistically significant differences between two groups of participants could also be observed in the reading of unambiguous sentences preceded by DO-biasing ($\beta = 0.281$, $SE = 0.062$, $p = .0002$) and SC-biasing ($\beta = 0.349$, $SE = 0.063$, $p < .0001$) contexts.

As for ambiguity, elevated reading times were observed in sentences lacking complementizers compared to their unambiguous versions irrespective of the context type and group variables. The difference in L2 speakers' critical region dwell times for ambiguous and unambiguous sentences following DO-biasing contexts turned out to be ~202 ms, whereas this difference was only ~58 ms in L1 English speaker group. In the SC-biasing context condition, it took L2 speakers ~127 ms longer to read the sentences when *that* was absent, while a difference of a mere ~15 ms was detected in the data obtained from L1 speakers. These differences, on the whole, led to a statistically reliable main effect of ambiguity (β = -0.193, SE = 0.028, t = -6.894). These findings imply that comprehenders were garden-pathed in the disambiguating region and then reread the ambiguous region, especially in the absence of the complementizer. It is also apparent that sense-promoting contexts and thus verb bias information failed to prevent readers from being garden-pathed in ambiguous sentences. The ambiguity effect as well as the differences between groups and context types are shown in Figure 4.6 below.

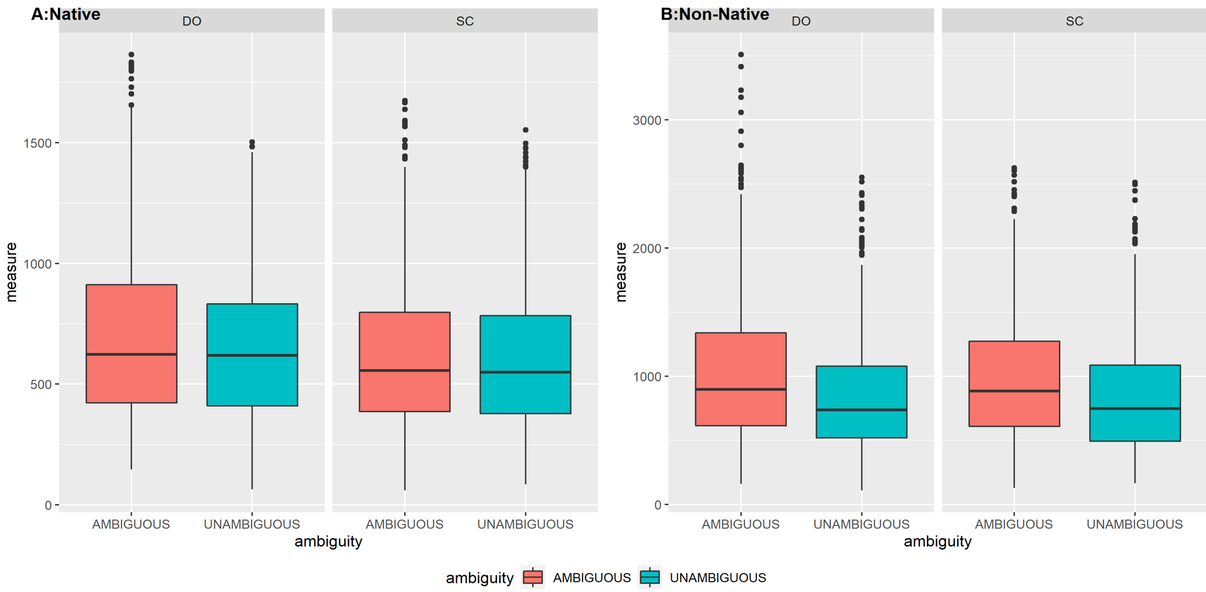

Figure 4.6. *Effects of ambiguity on L1 and L2 English speakers' dwell times in the critical region*

As well as the figure above, pairwise comparisons also displayed that L2 speakers suffered from a larger ambiguity effect at disambiguation compared to L1 speakers. More specifically, critical regions of ambiguous sentences took longer to process than those of unambiguous ones for L2 speakers in both SC-biasing (β = 0.138, SE = 0.029, p = .0001) and DO-biasing context conditions (β = 0.193, SE = 0.028, p < .0001). In contrast, the effect of ambiguity on L1 speakers' reaction times on this region did not turn out to be reliable (p > 0.05).

Moreover, there seemed to be a hint of a context-type effect on dwell times because in both groups of participants, dwell times in the critical regions of ambiguous sentences following DO-biasing contexts were obviously slowed compared to the ones preceded by SC-biasing contexts (~76 ms in L1 speakers and ~79 ms in L2 speakers). These differences resulting from context types did not seem to be so noteworthy in unambiguous sentences (~33 ms in L1 speakers and ~4 ms in L2 speakers). As a result of the application of the linear mixed effects model, the overall main effect of context type was not reliable. The fact that context did not remarkably influence reading times in the critical regions of SC continuations without *that* attests that DO structures could be the default interpretations no matter which type of contexts preceded the target sentences. The pairwise comparisons also lent weight to this non-significant effect as none of the planned comparisons of context types reached statistical significance.

In short, linear mixed-effects models revealed remarkable main effects of ambiguity and group, while the main effect of biasing context and the interactions were not found to be significant (all other ts < 1.55).

Finally, the split analyses performed for each group indicated that neither the main effects of ambiguity and context nor the interaction between them approached significance in L1 speakers' dwell times. Only the type of biasing context appeared to have a small but perceptible influence on this reading time measure ($\beta = -0.133$, SE = 0.081, $t = -1.648$). This marginal effect is probably due to L1 English speakers' elevated reading times following DO-biasing contexts. On the other hand, dwell times of L2 speakers were not influenced by context type at all, whereas ambiguity was found to have a reliable effect ($\beta = -0.193$, SE = 0.030, $t = -6.426$), with considerably slowed reading times when the complementizer was absent (with a difference of ~202 ms in DO-biasing and ~127 ms in SC-biasing conditions). These findings showed that L2 speakers did not use discourse context information while interpreting sentences in English, whereas this information source had a marginal effect on L1 speakers' processing. The lack of this effect in their first-run dwell times backed up the claim that discourse context information was used, to a certain extent, by readers at the reanalysis stage only.

4.7. Discussion of the Findings of Experiment 3

In the current experiment, whether comprehenders use their knowledge of sense-contingent subcategorization probabilities in the resolution of temporary SC/DO ambiguity was investigated through real-time eye-tracking. This section consists of two main points under discussion. First, the findings of the current experiment are discussed in consideration of two different sentence processing accounts: serial two-stage models (e.g. Frazier and Rayner, 1982; Frazier, 1987) and parallel-competitive models (e.g. Trueswell et al., 1993; Trueswell et al., 1994; MacDonald, 1994; MacDonald et al., 1994;

McRae et al., 1998). Secondly, L2 English speakers' parsing decisions are compared to those of L1 speakers and the similarities or differences between them are evaluated.

In the resolution of SC/DO ambiguity, serial Garden-Path Model (Frazier and Rayner, 1982) assumes that the NP *his girlfriend* in the temporarily ambiguous sentence *He recognized his ex-girlfriend had a series of operations, so she looked completely different* will initially be interpreted as the direct object of the verb regardless of the verb sense promoted by the preceding context and the associated SF. This prediction is mainly based on the simple parsing principle *Minimal Attachment* (Frazier, 1979). As the comprehender goes on reading, the upcoming material *had a series of operations* forces him/her to revise this NP as the subject of the sentential complement. As a result, since the reader is "led up the garden path", slowed reading and frequent regressions out of the disambiguation region are predicted. Also, whether the preceding context promoted the DO-biased or the SC-biased sense of the verb will initially make no significant differences in reading times as discourse context information will only be used by a separate reanalysis mechanism at later stages of parsing. These syntax-first models (Ferreira and Clifton, 1986; Frazier and Clifton, 1996); therefore, predict no remarkable slow-downs in the ambiguous region. The syntactic tendencies of verbs or the biasing contexts are not expected to have an impact on the reading times on this region as the parser simply constructs the least complex structure using the fewest nodes possible and pursues this single analysis. However, as the target sentences constructed for this experiment all include SCs, reanalysis will be inevitable, making it essential to consider the other possible analyses, as well (Rayner et al., 1983). This mismatch between the two analyses will therefore cause readers to slow down only in the disambiguating region.

Adopting a connectionist stance, constraint-based theories (e.g. MacDonald et al., 1994; Trueswell et al., 1994; McRae, Spivey-Knowlton and Tanenhaus, 1998; Green and Mitchell, 2006), on the other hand, maintain that the selection of the most satisfying interpretation can only be achieved with all possible analyses being active at varying degrees and competing with one another (McRae et al., 1998). Therefore, all grammatical and extra-grammatical information sources are immediately integrated into the parsing process because the activation level of each possible analysis is determined by them. Provided that an incorrect analysis wins much of the competition at early stages and the parser encounters new information incompatible with this initial interpretation, garden-paths occur. In that case, the parser has to endeavor to reverse this activation pattern, and it is the difficulty level of this task that determines the strength of the garden-path effect. The competition among these possible analyses is expected to lead to slowed reading in both ambiguous and disambiguation regions of sentences. As stated by Hare et al. (2003), as well as the sense-contingent SFs, there seem to be several other constraints in the processing of the target sentences in the current study. The first and probably the strongest one is that verbs tend to favor DO arguments following tensed verbs (Bever, 1970) and this global transitivity bias of English inclines comprehenders to initially interpreting the post-verbal NPs as DOs. Only when their interpretation turns out to be incorrect upon encountering conflicting evidence, they revise their initial interpretation (Ferreira and Henderson, 1990). This global transitivity bias also seems to relate to the Minimal Attachment Principle (Frazier, 1987). The second constraint expected to affect the comprehenders' processing strategies is the presence of sense-promoting contexts. They were manipulated so as to find out whether/to what extent they would activate the intended verb senses and the associated SFs. Third, the presence or absence of the complementizer *that* is considered to have an effect. Its presence in unambiguous target sentences cues both the SC arguments and SC-biased verb senses. Similarly, when the sentences did not include *that*, it can be assumed that DO arguments and DO-biased senses are anticipated by readers (Juliano and Tanenhaus, 1994). In line with Hare at al.'s (2003) predictions, in the reading of ambiguous items preceded by DO-biasing contexts, constraints such as the global transitivity bias, DO-biasing contexts, the possible influence of these contexts on the retrieval of related SFs and the absence of the complementizer were expected to bias comprehenders towards a DO parse. Within the competition-integration framework (McRae et al., 1998; Spivey and Tanenhaus, 1998), the competition among these cues is reflected in the reading times. If one of these constraints outweigh the others, only one interpretation of a particular sentence is highly activated, bringing about little or no ambiguity. However, if these constraints are balanced and equally activated, this fierce competition results in greater differences in the reading times of ambiguous and unambiguous sentences.

Apart from these predictions about the pre-critical regions containing the ambiguous NPs, the structural information in the following disambiguation regions bears out the SC interpretations. This results in differing degrees of competition and ambiguity effect in ambiguous sentences (without complementizers) following SC-biasing and DO-biasing contexts. In ambiguous, SC-biasing sentences, global transitivity bias and the lack of complementizer support DO interpretations, whereas sense-biasing contexts and associated subcategorization preferences favor SC interpretations. In the disambiguation regions of these sentences, SC interpretations are obviously supported semantically. Despite the existence of a fair amount of competition among these constraints, the differences in the reading times of these ambiguous sentences and their unambiguous versions are not expected to be elevated too much. On the contrary, for ambiguous sentences preceded by DO-biasing contexts, all constraints (i.e. global transitivity bias, absence of the complementizer, discourse context information and the associated SFs) support DO interpretations. In addition to these, the fact that the following NPs are good candidates for being plausible DOs of the target verbs endorses their initial expectations of DO arguments. The obvious mismatch between the comprehenders' expectations of DOs and the SC arguments they encounter in the disambiguation regions will probably lead to larger ambiguity effects and elevated reading times in these sentences. Therefore, as in previous studies providing evidence for the constraint-satisfaction models (Trueswell et al., 1993; Garnsey et al., 1997; Hare et al., 2003), a reliable interaction between ambiguity and biasing contexts in the disambiguation region is predicted.

Considering the predictions of these two mainstream accounts and Clifton and Staub's (2008) suggestion that possible slow-downs in the reading times on ambiguous regions are also worth investigating, the effects of group, ambiguity and biasing context were analyzed in two separate areas of interest.

The results of the overall analyses revealed that ambiguity that resulted from the absence of the complementizer *that* led to increased reading times and more regressions out of the pre-critical region regardless of group and biasing context conditions. These longer reaction times in sentences without *that* imply that readers needed more time to reread and come up with the correct interpretation when the sentences were ambiguous. The results of split analyses also showed that in almost all reading time measures obtained from both groups of participants, ambiguity turned out to have a reliable effect. The absence of *that* caused more regressions and longer dwell times and regression path durations in the pre-critical region. However, this ambiguity effect persisted in the disambiguation region in only L2 English speakers, while it disappeared in L1 speakers. This pattern in L1 English speaker group contradicted the findings of several sentence processing studies involving native speakers of English (Rayner and Frazier, 1987; Holmes et al., 1989; Ferreira and Henderson, 1990; Trueswell et al., 1993; Kennison, 2001; Hare et al. 2003). This might suggest that L2 speakers were garden-pathed more strongly and had more difficulty recovering from them when the complementizer was absent. This also showed that less processing difficulty was induced at critical regions of unambiguous sentences irrespective of context type. This was probably due to the fact that an upcoming SC was anticipated following the complementizer. Its absence caused some trouble for both groups of participants as the parser did not expect SCs without complementizers. However, it led to a larger ambiguity effect in L2 speakers, which could be explained by the higher proportions of *that*-preference in the sentence completions of L2 speakers as reported in Sections 4.3 and 4.5.

Another finding was that the absence of the complementizer influenced both groups' first-run dwell times on the pre-critical region in an unexpected direction. First-run dwell times of both groups were longer when the complementizer was present, and a stronger ambiguity effect and a marginally reliable interaction between context type and ambiguity was observed in L2 English speakers, especially in the unambiguous/DO-biasing context condition. This may have been because the context promoted the DO-biased verb senses, which subsequently activated the associated SFs, that is, DO arguments. Contrary to their expectations, they encountered the complementizer which was a strong cue for an SC, and the fact that their initial expectations were violated early in the sentence could have elevated their reading times in the ambiguous NPs following *that*. On the contrary, first-run dwell times of L1 English speakers in this area in DO-biasing and SC-biasing context conditions were almost the same, which invalidated the explanation above for this participant group. Another factor that can account for these unanticipated increases in first-run dwell times in the presence of *that* can be the consecutive use of two function words (complementizer *that* and definite article *the*). Trueswell et al. (1993) also came up with similar findings and stated that readers probably skipped the first function word *that* and landed on the article *the*, which led to longer first-pass reading times in the pre-critical regions of these sentences. However, equally quick first-run dwell times for ambiguous and unambiguous sentences in SC-biasing context condition implied that it could be impossible to undervalue the effect of context type.

Apart from the pretty consistent findings between the two groups of participants as to the effect of ambiguity, it was discovered that discourse context information played a role in L1 speakers' parsing, though not in the expected direction initially. It was found out that their first-run dwell times on the ambiguous NPs were reliably longer following

SC-biasing contexts; however, this effect was reversed in dwell times and regression path durations. Biasing contexts also produced a marginally reliable effect on L1 speakers' regressions out of the pre-critical region, with more frequent regressive saccades following DO-biasing contexts. When their processing patterns in the critical region were analyzed, it was observed that the ~37 ms difference between their first-pass in ambiguous sentences preceded by two different context types failed to yield a significant main effect, and this suggested that discourse context information was not exploited by L1 English speakers in the construction of initial analyses. Delayed effects of this information source were found in L1 speakers with a marginally reliable difference of ~76 ms in dwell times. Slowed first-run dwell times on the critical regions of ambiguous sentences preceded by DO-biasing contexts compared to SC-biasing ones might show that for L1 speakers, the construction of a SC interpretation had already been complete following SC-biasing contexts when the readers reached the disambiguation. The lack of an ambiguity*biasing context interaction; however, weakens this argument to some extent. Even though they failed to reach reliability, elevated regression path durations in sentences without *that* also provided further support for readers' effort to reanalyze the critical regions. This mostly occurred when the preceding contexts biased L1 speakers towards DO interpretations. In other words, the mismatch between the biasing contexts and the syntactic structures encountered led comprehenders to make regressive saccades out of the disambiguating regions and reread the previous regions. All these findings are generally in line with the predictions of serial Garden-Path Models (Frazier and Rayner, 1982) as purely syntactic information seem to have guided the construction of initial analyses, while discourse context as a non-syntactic factor solely aided comprehenders in reanalyzing their misparsed sentences. As is claimed by these models, the temporarily ambiguous NPs following the target verbs were initially interpreted as DOs by the comprehension system (Minimal Attachment). This was reflected in almost equally quick readings of the SC continuations preceded by both SC and DO-biasing contexts. Therefore, it can be argued that both context types required reanalysis in the sentences following them, especially when the complementizer was absent. The lack of a fully reliable main effect of context and an interaction between ambiguity and context type on the reading time measures at disambiguation also displayed that discourse context and thus sense-contingent subcategorization information was not intensely active at subsequent stages of processing, either. The evidence against the immediate use of these information sources in the processing of temporarily ambiguous sentences was in line with the findings of Ferreira and Henderson, 1990 and Kennison, 2001, while disconfirming those of Trueswell et al., 1993; Garnsey et al., 1997; Trueswell and Kim, 1998 and Hare et al. 2003. As McElree and Nordlies (1999, p. 486) pointed out, although comprehension processes are typically "automatic and highly over-learned procedures", these processing mechanisms are not error-free by all means. Therefore, it can be inferred that the DO-biasing contexts followed by SC arguments mostly required the devotion of more mental resources compared to SC continuations preceded by contexts promoting the SC-biased verb senses and associated SFs. Only in the revision process does the discourse context information seem to play a role to some extent. Although context type had no remarkable influence on the regressions out of the critical region, the proportion of L1 English speakers' regressive eye movements out of the pre-critical region was quite high in the DO-biasing context condition. On the surface, this makes no sense because when the context biased them towards the DO reading, they expected a DO argument, and when *that* was absent, it appeared temporarily that they got one. However, contrary to expectations, regressions from this region are surprisingly high in L1 speaker data. This indicates that readers could have realized very rapidly that their initial DO analysis was incorrect; that is, before they even got to the disambiguation region.

As for L2 speakers' processing patterns, it is obvious that they did not follow an entirely different path, except that ambiguity effect on almost all reading time measures in the critical regions persisted. Considering their use of biasing context information, it can be clearly seen that it had no reliable effect on the reading times in the pre-critical region. Similarly, in the critical regions of ambiguous sentences where the comprehenders found out whether or not their initial analysis and the new-coming information were consistent, no reliable differences in first-run dwell times were observed in either context type. In the critical region, dwell times of L2 English speakers were ~202 ms longer for ambiguous sentences compared to their unambiguous versions when the context biased them towards DO reading, while it was only ~127 ms when preceded by SC-biasing contexts. However, the difference in L1 speakers' dwell times of ambiguous and unambiguous sentences do not seem to be so big (~15 ms following SC-biasing contexts and ~58 ms following DO-biasing contexts), implying that L2 speakers were garden-pathed in the disambiguating region, detected the problem and then returned to reread the ambiguous region, especially in the absence of the complementizer. It is also apparent that sense-promoting contexts failed to prevent them from being garden-pathed in ambiguous sentences. This also attests that DO structures could be the default interpretations no matter which verb senses the contexts biased them towards. The examination of the L2 readers' regressions displayed that they made more regressive eye movements in both regions of ambiguous sentences compared to the unambiguous versions, but context seemed to have almost no influence on it. Another point worth mentioning is that ambiguity turned out to have a reliable effect accompanied by a marginally reliable influence of biasing context on L2 speakers' regression path durations at disambiguation. The marginally significant interaction between these two variables suggested that L2 speakers of English made regressive saccades at the end of their first passes as they needed to reread the previous regions of the target sentences. This could be considered as an indication of more cognitive effort due to the mismatch between the promoted verb sense & SFs and the syntactic structures in the target sentences. Although this incongruity induced processing difficulty for both groups of participants, it seems to be more severe for L2 speakers. This could also be a sign of the existence of a clear cost to getting a DO-biasing context in sentences without *that* and L2 speakers' greater effort into the syntactic and semantic integration of the new information into the unfolding sentence. These findings do not seem to fit the assertions of constraint-based models that anticipate clear ambiguity and discourse context information effects on both pre-critical and critical regions. However, no influence of context information on both first-run and dwell times of L2 speakers mostly backed up the claims of the two-stage Garden-Path model. Taken all together, these findings revealed that discourse context information source became progressively informative as L2 speakers proceeded towards the end of the sentences.

The comparison of two participant groups' processing speed and routes led us to come up with some general implications for a better understanding of the differences between L1 and L2 processing. The first and most obvious finding was that L2 processing was slower, less automatic and more demanding than L1 processing. This was in line with the findings of a vast majority of L2 processing studies (Hoover and Dwivedi, 1998; Segalowitz, Segalowitz and Wood 1998; Frenck-Mestre, 2002; McDonald, 2006;Clahsen et al., 2010), which also found longer reading times in L2 speaker data whatever the topic under investigation and the experimental conditions were. Second, ambiguity caused by the absence of the complementizer *that* elevated the reading times of both groups of participants compared to those of their unambiguous counterparts. This also corroborates the findings of many L1 and L2 processing studies (Ferreira and Henderson, 1990; Henderson and Ferreira, 1990; Trueswell et al., 1993; Hare et al, 2003; Dussias and Cramer Scaltz, 2006; 2008). The ambiguity*group interaction on the dwell times of critical regions also revealed that the absence of *that* engendered a bigger processing difficulty for L2 speakers. Third, the marginal influence of discourse context information on regression path durations suggested that biasing context as a constraint was not strong enough to guide L1 and L2 parsing from the very beginning. However, the fact that it had an influence, though faint, on the dwell times of L1 speakers and the regression path durations of L2 speakers demonstrated that these two groups differed in the exact time at which they employed this information source. To be more precise, discourse context information comes into play later in L1 processing than in L2 processing. Moreover, L1 and L2 speakers appeared to have adopted similar methods to respond to the processing difficulty caused by the mismatch between the verb senses promoted and the SFs encountered. This provided proof for the incremental nature of processing in an L2, as well. Taking high numbers of regressions, increased dwell times and regression path durations as signs of robust garden-path effects and reanalysis, it can be concluded that L2 speakers are garden-pathed more severely and therefore reanalysis took much longer in this group. In other words, reanalysis seems to be more costly for L2 speakers compared to native speakers. In addition to slowing down and regressing out of the critical region, L2 speakers also spent longer times rereading the previous regions. The ambiguity * biasing context interaction in their regression path durations on the critical region is a signal that rereading occurred immediately after the comprehenders encountered the verb at disambiguation.

In sum, patterns of the reading times of both L1 and L2 speakers substantiated the claims of the Garden-Path model and thus those of lexical filtering accounts (Frazier, 1987; Frazier and Clifton, 1989; Ferreira and Henderson, 1990; 1991; Clifton, Speer and Abney, 1991). These suggested that both L1 and proficient L2 speakers of English tended to construct quick-and-easy DO analyses ignoring the information provided by biasing contexts, especially at early processing stages. The most plausible explanation for this trend seems to be these constructions' highly frequent use in both written and spoken language (Roland, Dick and Elman, 2007). Unless the cues provided to bias readers towards SCs are not strong enough, this global transitivity bias cannot be overridden by the presence of sense-promoting contexts. In parallel with both complexity and frequency-based approaches, the parser seems to have figured out the statistics of the language and, by default, generated expectations of DO arguments after verbs rather than making use of semantic information in the anticipation of upcoming syntactic structures. This contradicts Hare et al.'s (2003, 2004) claim that discourse context information and verb sense play a more prominent role than structural bias in the prediction of processing difficulty. Another statement at odds with the results of the present experiment was verb bias "is relevant only to the extent that the source reflects the particular context in which a verb appears in the experiment" (Gahl et al., 2004, p.436).

As to the evidence provided by the current research with regard to the architecture of the human parser, L1 and L2 speakers' lexically blind initial analyses could be taken as a hint for the modular architecture of the parser. Boland (1997) suggested that information flows from the lexical processor to the syntactic and semantic processors, respectively. In the processing of sentences with SC/DO ambiguity, the syntactic parser seemed to have initially ignored or, maybe, had no access to discourse context information. As the processing proceeded, it appeared to be informed by the semantic cues, though not sufficiently. All these findings supported the arguments of syntax-first models in which semantic analysis was preceded by syntactic analysis (Fodor, 1978; Frazier, 1978; Chomsky, 1981; Ferreira and Clifton, 1986). Rayner's (1983) thematic reanalysis model also posits that the parser can propose a reanalysis only if the syntactic processor breaks down.

From the perspective of lexical accounts of processing, the findings of the current study did not parallel the claims of lexical expectation hypothesis (Fodor, 1978; Ford, Bresnan and Kaplan, 1982; Holmes, 1984). The hypothesis stipulates that the parser tests out the syntactically possible alternatives by ranking them based on their likelihood of appearance in particular structural configurations. In our case, additional processing load was predicted for the DO-biasing context/DO-continuation condition compared to the SC-biasing context/SC-continuation condition. However, the parsing preferences seemed to be independent of sense-contingent verb bias, dropping another heavy hint about the validity of the minimal attachment principle.

Within the framework of SLA, there is a growing consensus on the slower and less automatized L2 processing due to the partial use of L1 parsing mechanisms. This brings with it the question of whether L1/L2 processing differences result from the non-target-like processing systems of L2 speakers or their inability to have end-state grammatical knowledge (Clahsen and Felser, 2006b, p.117). Clahsen and Felser (2006b) suggest that these two factors can apply in tandem. The grammatical impairment view is essentially based on Bley-Vroman's (1990) Fundamental Difference Hypothesis, which proposes that interlanguage grammars are not exactly the same as L1 grammars, and this leads L2 learners to use the shallow processing route owing to their failure in acquiring thorough, integrated grammatical knowledge. At the same time, this indicates that the acquisition of a target-like grammar may lay the way open for native-like processing performance. Another camp suggests that L2 learners might have acquired the detailed, implicit knowledge of grammar but different mental processes in L1 and L2 parsing could be responsible for the quantitative differences between them. For example, Felser and Cunnings (2012) discovered some differences in L2 learners' performances in off-line and online tasks, and they established that L2 speakers' grammatical knowledge may not always operate in real-time language processing as well as it does in language production. The findings of the present study also lent partial support to this view as L2 speakers of English were quite sensitive to biasing contexts in their productions, while they mostly ignored them in comprehension. In an attempt to explain these differences in learners' L2 competence and performance, some researchers underlined the need for distinguishing language knowledge involved in their linguistic competence from the knowledge they can put into use in processing (e.g. DeKeyser, 2000; Hulstijn, 2002; Ullman, 2005).

To sum up, the initial construction of DO interpretations in both groups revealed that L2 speakers acquired and used simple rules (heuristics) such as Minimal Attachment in their interpretations. Furthermore, it was found that L2 speakers appear to rely on discourse-context information relatively earlier than L1 speakers did. These two findings demonstrated that the use of the shallow parsing route is predominant in L2 learners, while L1 learners preferred relying more on structure building rules and delaying the use of non-grammatical information sources. Overall, these are in line with the propositions of the Shallow Structure Hypothesis (Clahsen and Felser, 2006b). Therefore, interlanguage grammars of L2 learners and the mental processing systems they rely on are only two of several factors that possibly lie behind these differences between L1 and L2 processing. The claim that increasing L2 proficiency and fluency enable learners to go from the declarative system to the procedural one indicates that native-like processing is an attainable goal for L2 learners.

5. CONCLUSION, IMPLICATIONS AND SUGGESTIONS

5.1. Introduction

This chapter provides a brief summary of the present study and then the general conclusions drawn from its findings. Afterwards, some research implications based on the significance of the findings for ESL/EFL practice and theory are presented, and most of these implications are aimed at ESL/EFL learners/teachers and curriculum designers. The final section addresses some limitations of the current study and offers recommendations for further research.

5.2. Summary of the Study

This research primarily aims to delve into the complex relationship between sense-contingent SFs and the use of this knowledge by L1 and L2 speakers in the generation and comprehension of language. The main goal is to cover three different aspects of the research problem (L1 and L2 speakers' verb sense & SF preferences out of context, their sense and SF preferences in the presence of biasing contexts and their use of sense-contingent SF and discourse context information in real-time comprehension), each one of which was investigated in separate experiments.

First of all, the question of whether L2 speakers are capable of learning/using the knowledge of sense-contingent SFs as efficiently as L1 speakers was addressed. In the investigation of this issue in Experiment 1, a sentence completion task which provided no contextual support was administered to L1 and L2 English speakers. In Experiment 2, the possible influence of the presence of biasing contexts on L1 and L2 speakers' verb sense and SF preferences was examined through another language production task in which the sentence fragments were preceded by context sentences. These sentences aimed at biasing the participants towards the SC-biased or DO-biased senses of the target verbs. Lastly, in Experiment 3, whether or to what extent the knowledge of sense-contingent verb SFs and discourse context information guides real-time language comprehension was investigated. These questions were addressed separately for L1 and L2 speakers of English so that the possible similarities/differences between their use of various information sources and the resultant processing patterns would be found. This was expected to shed light onto the architecture and the role of the parser in L1 and L2 comprehension, which might bring about some fundamental differences in the processing efficiencies of L1 and L2 readers. Therefore, the present study aims to make a contribution to the ongoing debate over whether non-grammatical information sources such as discourse context information are operative in the construction of initial analyses (constraint-based approaches) or they solely aid in the revision of initial misparses (serial, two-stage accounts). Moreover, it aims to take its place in the growing body of research on whether proficient learners can attain end-state L2 grammar and put it in use in the comprehension of the target language.

A total of 113 native speakers of American English and 169 L1 Turkish - L2 English speakers took part in the current study. Prior to the study, a small-scale corpus testing was carried out in order to provide further support for Roland's (2001) and Hare et al.'s (2003) suggestion that verb semantics is one of the factors influential in the formation of polysemous verbs' subcategorization probabilities. Then the participants' English proficiency levels were determined based on the results of a standard test. L2 English speakers ranging between the intermediate and advanced levels as well as L1 speakers of English participated in two off-line language production experiments (i.e. sentence completion tasks) and an eye-tracking experiment including sentences with temporary SC/DO ambiguity. The data collected were then analyzed using descriptive and inferential statistical tools and techniques such as hierarchical log-linear analysis, linear mixed-effects models and partial chi-square tests so as to reveal the relationships between the defined variables.

5.3. Conclusions of the Research Questions

In this section, the findings of the current study are summed up in a nutshell based on the research questions, which guided the study.

Do L1 and L2 speakers use the multiple senses of English polysemous verbs and the different subcategorization frames (SF) contingent on verb senses in the absence of semantically biasing contexts on an off-line sentence completion task?

The findings of Experiment 1 (in which no biasing contexts were provided) showed that L1 and L2 speakers somewhat differed in their verb sense preferences. Almost no remarkable differences were found between L1 speakers' use of DO-biased (45%) and SC-biased (44%) verb senses. However, the proportion of SC-biased senses (44%) was higher than that of DO-biased senses (36%) in L2 speakers' sentence completions. The examination of the individual verbs' dominant senses revealed that L1 and L2 speakers had similar verb sense preferences in 12 out of 20 verbs. As to the use of sense-contingent SFs, it could obviously be seen that both groups had a general tendency to use DO arguments more often than SC arguments. The examination of the overall structural biases of individual verbs also demonstrated that these two groups of participants displayed similar structural preferences in 15 out of 20 target verbs. The overwhelming majority of both L1 and L2 speakers' continuations following DO-biased verb senses included DOs (*L1 speakers:* 94%, *L2 speakers:* 93%). On the other hand, L2 speakers seemed to have a stronger inclination towards using more SC arguments following verbs with SC-biased senses than L1 speakers did (*L1 speakers:* 40%, *L2 speakers:* 60%). Finally, argument structures *Other* than SCs and DOs were used more frequently by L1 speakers following the SC-senses (*L1 speakers:* 21%, *L2 speakers:* 8%), whereas the proportions were found to be the same following the DO-senses (*L1 speakers:* 6%, *L2 speakers:* 6%). Overall, this suggested the availability and accessibility of a wider range of SFs in L1 speakers. All these findings indicated that L2 speakers, like L1 speakers, gained some knowledge of sense-contingent SFs and could use this knowledge while producing sentences in an L2. In other words, verb senses appear to have guided the SF selections of both participant groups, though in varying degrees.

Is L1 and L2 speakers' use of these polysemous verbs and the different SFs promoted by semantically biasing contexts on an off-line sentence completion task?

When the verb sense and SF preferences of the participants in the presence of biasing contexts were examined, it could be concluded that biasing contexts were effective, to a great extent, in activating the intended verb senses and the associated SFs in both groups of participants. In L1 English speaker data, the SC-senses of verbs were used more frequently in the presence of SC-biasing contexts compared to the no-context condition (*Exp 1:* 44%, *Exp 2:* 95%). Likewise, considerable increases were observed in the use of DO-senses following the DO-biasing contexts (*Exp 1:* 45%, *Exp 2:* 79%). Findings about L2 English speakers' sense preferences were also in the same direction, with more frequent uses of the promoted verb senses in the presence of biasing contexts (*SC-senses: Exp 1:* 44%, *Exp 2:* 78%; *DO-senses: Exp 1:* 36%, *Exp 2:* 61%). These percentages and inferential statistics regarding the effect of *group* revealed that L1 speakers were more responsive to the presence of context sentences compared to L1 speakers. The analyses of the structural preferences of the participants demonstrated that the proportions of common DO arguments had a falling tendency in both L1 and L2 speaker continuations when the participants were semantically constrained by biasing contexts. Overall, L1 English speakers showed sensitivity to the sense-contingent SFs following both the SC-senses (*SC arguments: Exp 1:* 40%, *Exp 2:* 66%) and the DO-senses (*DO arguments: Exp 1:* 94%, *Exp 2:* 89%) of the target verbs. Likewise, L2 speakers were influenced by the guidance of the SC-biasing (*SC arguments: Exp 1:* 60%, *Exp 2:* 73%) and DO-biasing (*DO arguments: Exp 1:* 93%, *Exp 2:* 84%) context sentences, but not to the same extent as L1 speakers were.

Do L1 and L2 English speakers make use of discourse context information and their knowledge of verbs' sense-contingent subcategorization probabilities during real-time sentence processing?

The findings obtained from the eye-tracking experiment demonstrated that ambiguity resulting from the lack of the complementizer *that* led to garden-path effects in both groups of participants; however, this effect lasted longer for L2 speakers. In addition, the mismatch between the biasing contexts and the subsequent SFs caused elevated dwell times, regression path durations and more regressive eye movements, though in varying degrees in L1 and L2 groups. Further, first-run dwell times on the pre-critical and critical regions showed that neither group was found to use discourse context information in the construction of their initial analyses. The marginally reliable effect of biasing contexts and the marginally reliable interaction between ambiguity and biasing context on the critical region in L2 speaker data revealed that they regressed out of the critical region and spent longer times rereading the previous content in the ambiguous target sentences, especially when there was a mismatch between the verb sense promoted and the subsequent SF. Taken together, frequent regressions-out, elevated regression path durations and dwell times on the critical region signaled a more costly reanalysis and more effort required for the integration of the new semantic and syntactic input into the evolving interpretation for L2 speakers. On the other hand, the reliable effect of biasing contexts on L1 English speakers' dwell times on the critical region suggested that they employed this information source to a degree when they were revising their initial misparses. The relatively delayed use of discourse context information by L1 speakers revealed that they relied primarily on purely syntactic information, especially at early stages of processing, and discourse context information became informative only at a much later stage of processing. Finally, based on the findings that reading times were always slowed in L2 speakers, it was concluded that L2 processing was slower and less automatized than L1 processing.

Summing up the key findings, the results revealed that both L1 and L2 speakers of English have a certain level of knowledge about the relationship between verb senses and sense-contingent SFs. However, the performances of L2 speakers differed from L1 speakers' in both the production and comprehension of these structures although it was observed that sense-contingent SFs in English seemed to be a part of L2 learners' competence. These two groups were also dissimilar in their sensitivity to contextual cues, with L1 speakers responding to them more rapidly and efficiently. The findings obtained from the production data lent partial support to the claims of Fundamental Difference Hypothesis. As suggested by Bley-Vroman (1990), the lack of L2 speakers' direct access to UG might have led to a reduced awareness and a disconnect between their competence and performance in the L2.

As to the possible differences between L1 and L2 speakers' sentence comprehension processes, some qualitative and quantitative differences between their processing speed and patterns were obvious as in several previous studies. Processing patterns of the two groups were similar in that they both supported the predictions of serial, two-stage processing accounts (i.e. Garden-Path Theory). It was observed that they used some simple heuristics (i.e. Minimal Attachment) in the construction of initial analyses and both groups of participants employed discourse context information at later stages, with L2 speakers using it relatively earlier. The use of some universal parsing principles and an earlier use of non-grammatical information sources were compatible with the main arguments of the Shallow Structure Hypothesis (Clahsen and Felser, 2006b). Finally, the slower and more effortful L2 processing lent support to Sorace's (2011) Interface Hypothesis, which highlights the difficulty of integrating syntactic and non-syntactic information sources for L2 learners.

5.4. Implications for ESL/EFL Teaching and Learning

The results of the present study, which specifically aimed to shed more light on learning/teaching such a troublesome grammatical structure as SFs of polysemous verbs, were expected to offer some practical implications to English language learners and teachers, especially in ESL/EFL contexts. The learning implications have previously been explained in some detail in the sections where the findings of each experiment are discussed, and a holistic overview of them along with some teaching implications will be provided in this section.

First, the present study revealed that semantic properties of verbs affect their syntactic preferences. This provided further evidence for the existence of syntax/semantics interface, which substantiated the assumption that the separation of lexicon and grammar is out of the question. As a result of this, lexicalized grammars could gain ground in the pedagogy of grammar instruction.

Furthermore, it was observed that L2 learners did not always prefer the shorter, easier and readily accessible direct object constructions when they were required to complete a scenario. The fact that their SF selections were influenced by the discourse context information could have evidential value for the importance of the semantic clues provided in the learning/teaching of these patterns. This apparent influence of discourse context information might underline the significance of and the need for contextualized grammar teaching.

The findings of production and comprehension tasks can also give us a real insight into the difficulties L2 learners encounter. Having a good grasp of the nature of L2 processing mechanisms might also provide us with a better understanding of L2 acquisition. In spite of the examination of only a limited number of verbs in the present study, the in-depth analyses of the preferred senses and SFs of individual verbs unveiled that their idiosyncratic properties could make them challenging to learn. These analyses conceivably enable us to identify verb-specific errors. They also give us some clues as to the influence of learners' L1 subcategorization knowledge on their preferences for the argument structures in an L2. In the present study, there seems to be two main reasons that led to considerable confusion and common errors in the use of SFs: the phonological similarities between some verbs in the target language (e.g. anticipate - participate) and the fact that two separate English verbs can be denoted by a single verb in L2 speakers' native languages. In brief, knowing whether learners' L1s play a key role in the acquisition of SF patterns (positive or negative transfer) will help language professionals to have a better insight in designing pedagogical materials and shed light on their understanding of language processing. Exploring the subtle verbal subcategorization patterns is also expected to contribute to material development, syllabus design and language instruction. These might remove the obstacles in the way of acquiring L2 end-state grammars.

The difficulties L2 speakers ran into revealed a lack of automaticity in their language production and comprehension. This suggests that automaticity can be improved through repetitive exposure and experiences, deliberate and methodical practice. In this way, whether they be lexical items or syntactic structures, new information can be driven further into long-term memory, ensuring speedy and accurate processing of information and building up immunity to interference.

Another finding of this study was that L2 speakers demonstrably had some knowledge of sense-contingent verb subcategorization probabilities and they were quite responsive to the presence of sense-promoting discourse contexts. Nevertheless, their preferences in written production and their processing patterns in the presence of biasing contexts somewhat diverged from those of L1 English speakers. These differences between the comprehension patterns and strategies of L1 and L2 speakers indicate that their interlanguage grammars or mental processing systems might be responsible for their reduced efficiency in language processing. Also, the finding that L2 learners predominantly rely on the shallow processing route revealed the incomplete acquisition of integrated grammatical knowledge. Increased proficiency level and fluency may help overcome these problems. This is a topic that can be further investigated in the future from the perspective of grammar instruction.

In brief, the results of the present study aim at raising both learners' and teachers' as well as material and curriculum designers' awareness of the various factors that could be influential on the teaching/learning of verbal complementation, which is considered to be challenging for all these groups.

5.5. Limitations and Suggestions for Further Research

It is an agreed-upon fact that verb sense is only one of the factors having an effect on the formation of subcategorization probabilities. Taking this into consideration, the current research attempted at carrying out an investigation of the interaction between grammatical representations, language production and comprehension factors. Some constructive suggestions for future research may carry the findings of the present study a step further and aid in illuminating the factors influential in the language production and comprehension processes of L2 learners.

To start with the suggestions regarding the stimuli that can be used to look into this specific topic, it could be a good idea to carry out similar studies using different sets of verbs and a higher number of equi-bias verbs. It might be beneficial to check whether each one of these factors has the potential to change the direction of the findings of the present study. Also, additional conditions such as DO-biasing context/DO argument or SC-biasing context/DO argument can also be included and the eye-tracking experiment can be replicated.

From a different perspective, replicating this kind of studies with different groups of participants will definitely give us the freedom of an unfaltering generalization of the findings. A meticulous study of inter-individual differences can provide us with a deeper understanding of some underlying reasons of disruption in syntactic processing. It is usually hard to distinguish between whether the differences in L2 speakers' processing mechanisms or the selection of participants produce the results obtained. Thus, working with different groups of participants will present the opportunity to compare the findings from these groups. Therefore, further studies can address the possible effects of individual factors such as participants' reading span, reading speed, working memory capacity, proficiency level, age and length of exposure to the target language. Including two groups of participants with different English proficiency levels is one of the limitations of the present study. Although it is possible to group low and upper-intermediate participants as intermediate level L2 learners, analyzing the data from these two groups separately may reveal some developmental (proficiency level) effects.

Another point under discussion about L2 studies is the possible effects of participants' native languages. Owing to the scarcity of research taking into consideration the differences between L1s, further testing of different L1 groups is required. It may contribute to the ongoing discussion of whether L2 learners transfer their knowledge of verb subcategorization or sentence processing strategies from their L1s. Fine distinctions between the verbs acting in similar or completely different manners in participants' L1s and L2s can only be drawn by including participants with different L1 backgrounds. For example, a remarkable finding of this study was L2 speakers' stronger tendency (compared to L1 speakers) to use SCs rather than DOs, which is in stark contrast with the global transitivity bias in English. Further investigation might be required to find out whether it is specific to L2 learners with Turkish background or just a common phenomenon among all L2 English learners. A comparison of L2 learners' SF preferences following the target verbs with the biases of these verbs in Turkish may provide deeper insight into the role of L1 transfer as an underlying factor leading to the differences between L1 and L2 speakers. Also, L2 learners' stronger preferences for overt complementizers in English might be explained by the use of bound morphemes at the end of verb stems in subordinate clauses in Turkish; therefore, further research into this issue might reveal the possible effects of L2 speakers' native languages.

Furthermore, only written production and comprehension data were gathered in the present study. In order to see the wider picture, setting the participants various tasks can enrich the methodologies of the studies of this type. For example, for the sentence production experiment, speeded grammaticality judgments can also be administered. In this way, it can be discovered whether participants' verb sense selections are because they lack knowledge about some specific senses of the target verbs or because they just prefer one over another. Moreover, spontaneous spoken production or spoken language processing data can also be collected to see whether similar findings will come up.

Lastly, looking into the possible influence of L2 speakers' exposure to certain constructions and structures may illuminate L1 and L2 speakers' divergent SF preferences such as the overuse of SC arguments or their reduced sensitivity to discourse context information. Even though it is really hard to measure exposure, analyzing some course books commonly used to teach English at schools in the Turkish context is worth a try as it may contribute to the discussion on the role of frequency of exposure in second language acquisition/learning.

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APPENDICES

APPENDIX-1. Overall Subcategorization Biases for the 20 Verbs Used in the Current Study (Previous studies & COCA)

VERB	Trueswell, Tanenhaus & Kello (1993) *(norming study)*	Garnsey, Pearlmutter, Myers & Lotocky (1997) *(norming study)*	Jennings, Randall & Tyler (1997) *(norming study)*	Hare, McRae & Elman (2003) *(Brown Corpus)*	Hare, McRae & Elman (2003) *(WSJ Corpus)*	Hare, McRae & Elman (2003) (*WSJ87/BLLIP*)	Hare, McRae & Elman (2003) *(Switchboard)*
1. FIND	-	-	-	DO-BIAS	DO-BIAS	DO-BIAS	DO-BIAS
2. ADMIT	NO-BIAS	SC-BIAS	EQ-BIAS	EQ-BIAS	EQ-BIAS	EQ-BIAS	NO-BIAS
3. INDICATE	-	SC-BIAS	EQ-BIAS	EQ-BIAS	SC-BIAS	SC-BIAS	SC-BIAS
4. REPORT	-	-	-	EQ-BIAS	DO-BIAS	DO-BIAS	DO-BIAS
5. ADD	-	-	-	DO-BIAS	EQ-BIAS	EQ-BIAS	DO-BIAS
6. OBSERVE	DO-BIAS	-	-	EQ-BIAS	SC-BIAS	EQ-BIAS	-
7. BET	-	-	-	SC-BIAS	SC-BIAS	SC-BIAS	SC-BIAS
8. GRASP	-	-	-	DO-BIAS	DO-BIAS	DO-BIAS	DO-BIAS
9. RECOGNIZE	-	-	-	DO-BIAS	DO-BIAS	NO-BIAS	DO-BIAS
10. REVEAL	DO-BIAS	-	NO-BIAS	DO-BIAS	DO-BIAS	DO-BIAS	-
11.ESTABLISH	-	DO-BIAS	-	-	-	-	-

APPENDIX-1. (Continued) Overall Subcategorization Biases for the 20 Verbs Used in the Current Study (Previous Studies & COCA)

VERB	Trueswell, Tanenhaus & Kello (1993) *(norming study)*	Garnsey, Pearlmutter, Myers & Lotocky (1997) *(norming study)*	Jennings, Randall & Tyler (1997) *(norming study)*	Hare, McRae & Elman (2003) *(Brown Corpus)*	Hare, McRae & Elman (2003) *(WSJ Corpus)*	Hare, McRae & Elman (2003) (*WSJ87/BLLIP*)	Hare, McRae & Elman (2003) *(Switchboard)*
12. FEEL	EQ-BIAS	EQ-BIAS	-	EQ-BIAS	SC-BIAS	SC-BIAS	SC-BIAS
13. CONFIRM	DO-BIAS	DO-BIAS	NO-BIAS	DO-BIAS	EQ-BIAS	EQ-BIAS	-
14. REFLECT	-	-	-	DO-BIAS	DO-BIAS	DO-BIAS	-
15. DISCOVER	-	DO-BIAS	DO-BIAS	-	-	-	-
16. CLAIM	SC-BIAS	SC-BIAS	SC-BIAS	EQ-BIAS	SC-BIAS	SC-BIAS	SC-BIAS
17. ACCEPT	DO-BIAS	DO-BIAS	DO-BIAS	-	-	-	-
18. RECALL	DO-BIAS	-	-	DO-BIAS	EQ-BIAS	DO-BIAS	DO-BIAS
19. DECLARE	-	EQ-BIAS	EQ-BIAS	SC-BIAS	EQ-BIAS	DO-BIAS	DO-BIAS
20.ANTICIPATE	-	-		DO-BIAS	DO-BIAS	DO-BIAS	EQ-BIAS

APPENDIX-1. (Continued) Overall Subcategorization Biases for the 20 Verbs Used in the Current Study (Previous studies & COCA)

VERB	**Trueswell, & Kim (1998)** ***(corpus analysis)***	**Kennison (1999)** ***(norming study)***	**Wilson & Garnsey (2009)** ***(norming study)***	**Hare, McRae & Elman (2004)** ***(Brown Corpus)***	**Hare, McRae & Elman (2004)** ***(WSJ Corpus)***	**Hare, McRae & Elman (2004)** **(*WSJ87/BLLIP)***	**Corpus of Contemporary American English** ***(present study)***
1. FIND	-	DO-BIAS	DO-BIAS	-	-	-	DO-BIAS
2. ADMIT	EQ-BIAS	SC-BIAS	SC-BIAS	EQ-BIAS	EQ-BIAS	EQ-BIAS	SC-BIAS
3. INDICATE	-	SC-BIAS	SC-BIAS	EQ-BIAS	SC-BIAS	SC-BIAS	SC-BIAS
4. REPORT	-	DO-BIAS	-	EQ-BIAS	DO-BIAS	DO-BIAS	DO-BIAS
5. ADD	-	-	-	-	-	-	DO-BIAS
6. OBSERVE	-	DO-BIAS	-	EQ-BIAS	SC-BIAS	EQ-BIAS	DO-BIAS
7. BET	-	-	-	-	-	-	SC-BIAS
8. GRASP	-	-	-	-	-	-	DO-BIAS
9. RECOGNIZE	-	DO-BIAS	-	DO-BIAS	DO-BIAS	NO-BIAS	DO-BIAS
10. REVEAL	EQ-BIAS	DO-BIAS	-	DO-BIAS	NO-BIAS	DO-BIAS	EQ-BIAS
11.ESTABLISH	-	DO-BIAS	DO-BIAS	DO-BIAS	DO-BIAS	DO-BIAS	DO-BIAS

APPENDIX-1. (Continued) Overall Subcategorization Biases for the 20 Verbs Used in the Current Study (Previous studies & COCA)

VERB	**Trueswell, & Kim (1998)** ***(corpus analysis)***	**Kennison (1999)** ***(norming study)***	**Wilson & Garnsey (2009)** ***(norming study)***	**Hare, McRae & Elman (2004)** ***(Brown Corpus)***	**Hare, McRae & Elman (2004)** ***(WSJ Corpus)***	**Hare, McRae & Elman (2004)** **(*WSJ87/BLLIP)***	**Corpus of Contemporary American English** ***(present study)***
12. FEEL	-	EQ-BIAS	-	EQ-BIAS	EQ-BIAS	EQ-BIAS	SC-BIAS
13. CONFIRM	NO-BIAS	DO-BIAS	DO-BIAS	DO-BIAS	EQ-BIAS	EQ-BIAS	NO-BIAS
14. REFLECT	-	-	-	-	-	-	DO-BIAS
15. DISCOVER	EQ-BIAS	DO-BIAS	DO-BIAS	EQ-BIAS	EQ-BIAS	EQ-BIAS	DO-BIAS
16. CLAIM	-	EQ-BIAS	SC-BIAS	EQ-BIAS	SC-BIAS	SC-BIAS	SC-BIAS
17. ACCEPT	DO-BIAS	DO-BIAS	DO-BIAS	DO-BIAS	DO-BIAS	DO-BIAS	DO-BIAS
18. RECALL	-	DO-BIAS	-	DO-BIAS	EQ-BIAS	DO-BIAS	DO-BIAS
19. DECLARE	-	DO-BIAS	-	SC-BIAS	EQ-BIAS	DO-BIAS	DO-BIAS
20.ANTICIPATE	-	SC-BIAS	-	DO-BIAS	DO-BIAS	DO-BIAS	DO-BIAS

APPENDIX-2. Hare et al.'s (2004) Results of Multi-Corpus Analysis for the Sense-Contingent Biases of 11 Polysemous Verbs Used in the Present Study

Sense-based norms (senses as defined by WordNet). For each verb, the first row gives the total number of occurrences in the corpus and the verb's overall percentage of DO/SC completions. The following rows give the sense, its total number of DO/SC occurrences, and the DO and SC completions by sense.

	WN			***BC***			***WSJ / WSJ87***		
VERB and SENSE	***Total****	***DO***	***SC***	***Total***	***DO***	***SC***	***Total***	***DO***	***SC***
ADMIT	42	19%	38%	90	22%	31%	64	28%	47%
1. acknowledge	23	7	16	44	16	28	46	16	30
2. let in	1	1	0	4	4	0	2	2	0
*ANTICIPATE***	6	83%	0%	31	52%	0%	200	38%	12%
*1&3. regard as probable****	2	2	0	10	10	0	84	61	23
2. act in advance of	3	3	0	6	6	0	14	14	0
CLAIM	21	38%	33%	92	29%	32%	123	22%	68%
1. assert	7	0	7	36	7	29	92	8	84
2. lay claim to	4	4	0	5	5	0	10	10	0
3. ask for legally	1	1	0	11	11	0	4	4	0
4. take, claim, as an idea	3	3	0	4	4	0	5	5	0
DECLARE	23	26%	30%	91	15%	29%	87	29%	21%
1. state clearly	9	3	6	27	6	21	19	3	16
2. performative	4	3	1	12	7	5	5	3	2
3. dividens	0	0	0	1	1	0	19	19	0
DISCOVER	21	19%	38%	118	41%	33%	64	36%	30%
1&3. notice, find	4	3	1	39	29	10	25	17	8
2&4. learn, find out	3	1	2	32	16	16	17	6	11
FEEL	164	18%	37%	200	21%	22%	208	13%	35%
1. experience emotionally	22	21	1	30	28	0	18	17	1
2. come to believe	65	6	59	42	2	40	78	7	71
3. experience through senses	2	2	0	12	9	3	4	4	0

APPENDIX-2. (Continued) Hare et al.'s (2004) Results of Multi-Corpus Analysis for the Sense-Contingent Biases of 11 Polysemous Verbs Used in the Present Study

	WN			*BC*			*WSJ / WSJ87*		
VERB and SENSE	***Total****	***DO***	***SC***	***Total***	***DO***	***SC***	***Total***	***DO***	***SC***
INDICATE	72	25%	42%	240	33%	38%	197	25%	54%
1. signal, e.g., symptoms	23	12	11	130	62	68	97	44	53
2. literally or figuratively point	10	6	4	6	5	1	2	2	0
3. state briefly	15	0	15	34	12	22	57	4	53
OBSERVE	24	46%	17%	111	29%	14%	330	24%	19%
1. find, discover, notice	3	2	1	19	10	9	42	21	21
2. mention	3	0	3	7	0	7	41	0	41
3. pay attention to, note	4	4	0	5	5	0	12	12	0
4&7. watch attentively	2	2	0	9	9	0	5	5	0
5. respect, abide by	2	2	0	6	6	0	30	30	0
6. celebrate, keep	1	1	0	2	2	0	10	10	0
*RECALL***	26	69%	8%	78	55%	17%	200	27%	8%
1. remember	16	14	2	46	33	13	46	31	15
2. refer back to	1	1	0	1	1	0	0	0	0
3. call to mind	2	2	0	7	7	0	2	2	0
4. summon to return	1	1	0	2	2	0	3	3	0
6&7. make unavailable; call back faulty goods	0	0	0	0	0	0	17	17	0
RECOGNIZE	44	50%	23%	146	42%	10%	200	43%	24%
1. acknowledge, accept	15	11	4	41	34	7	37	29	8
2. be aware of, realize	12	6	6	22	14	8	67	27	40
financial (put on the books)	0	0	0	0	0	0	16	16	0
3&4. know from previous acquaintance with	5	5	0	14	14	0	13	13	0
REVEAL	30	47%	13%	92	72%	9%	200	58%	23%
2. disclose, let on	8	4	4	24	20	4	51	41	10
1&3. uncover, make visible; display, show	10	10	0	50	46	4	110	75	35

Examples of each sense available on-line at http://rowan.bgsu.edu/corpora.html
* Totals for WordNet based on occurrences of the sense in all structures.
** Data from WSJ87 was used in place of WSJ.
*** Two WN senses were indistinguishable in corpora, and treated as a single sense

APPENDIX-3. Two Senses and Sample Sentences of the Target Verbs and Verbs Used in the Filler Items in the Pilot Study

(The definitions and sample sentences below were taken from online *Longman Dictionary of Contemporary of English, Cambridge Dictionary* and *Oxford English Living Dictionaries*)

1. ACKNOWLEDGE (target)

SC-sense: to admit or accept that something is true or a situation exists

He acknowledges that when he is tired, he gets bad-tempered.

DO-sense: to publicly express thanks or gratitude for something

We wish to acknowledge the support of the university.

2. STATE (filler)

3. ADD (target)

SC-sense: to say more about something that has just been said

Everyone will be invited to vote, he said, adding that voting is likely to be via the web.

DO-sense: to make an addition, to put something with something else

Do you want to add your name to the list?

4. DECIDE (filler)

5. ADMIT (target)

SC-sense: to declare to be true or to admit the existence / reality / truth of something

You may not like her, but you must admit that she is good at her job.

DO-sense: to allow someone to enter a public place

They admitted ticket-holders into the stadium.

6.COMMAND (filler)

7. ANTICIPATE (target)

SC-sense: to expect or realize that something will happen, to make a prediction about something

This year we anticipate that our expenses will be 15% greater.

DO-sense: to think about something that is going to happen, especially something pleasant; to be excited about something

Daniel was eagerly anticipating her arrival.

8.REMIND (filler)

9.BET (target)

SC-sense: to say that you are fairly sure something is true, something is happening although you cannot prove this

I bet she will find an excuse and won’t come with us tonight.

APPENDIX-3. (Continued) Two Senses and Sample Sentences of the Target Verbs and Verbs Used in the Filler Items in the Pilot Study

DO-sense: to risk money on the result of a game, race or other future event, to gamble

She bet all her money on a horse that came last.

10.LEARN (filler)

11.CLAIM (target)

SC-sense: to state that something is true, even though it has not been proven

She claims that she is not a feminist, but she would like to see more women in top jobs.

DO-sense: to officially demand or receive money from an organization because you have a right to it

She should be able to claim the price of the ticket back.

12.ORDER (filler)

13.CONFIRM (target)

SC-sense: to show that something is definitely true, especially by providing more proof

Research has confirmed that the risk is higher for women.

DO-sense: to tell someone that a possible arrangement, date or situation is now definite or official

Could you confirm the dates we discussed?

14. ALLOW (filler)

15.DECLARE (target)

SC-sense: to state officially and publicly that a particular situation exists or that something is true

The court declared that Brown's case should be reviewed.

DO-sense: to announce publicly or officially

Several countries declared Antarctica a 'world park'

16. ACCUSE (filler)

17. FEEL (target)

SC-sense: to have a particular opinion, especially one that is based on your feelings, not on facts

Some of the parents felt the school wasn't doing enough about bullying.

DO-sense: to perceive by a physical sensation, e.g. coming from the skin or muscle

Mum, feel this stone! Isn't it smooth?

18. EXAMINE (filler)

APPENDIX-3. (Continued) Two Senses and Sample Sentences of the Target Verbs and Verbs Used in the Filler Items in the Pilot Study

19. FIND (target)

SC-sense: to discover the fact of, to come to believe on the basis of emotion, intuitions or definite grounds

She looked at her glass and was amazed to find that it was empty.

DO-sense: to locate, to come upon after searching

I have to find somewhere else to live.

20. DETERMINE (filler)

21. GRASP (target)

SC-sense: to understand something, especially something difficult

Due to the unusual bustle of hospital activity, they grasped that something was clearly wrong with Megan.

DO-sense: to take something in your hand and hold it firmly

I was so angry with what she had said to me that I grasped her arm firmly and warned her not to do it again.

22. TEACH (filler)

23. INDICATE (target)

SC-sense: to say or do something to make your wishes, intentions, etc clear

She indicated that she didn't want me to say anything.

DO-sense: to point or show a person, direction, place or thing

'That's her,' said Toby, indicating a girl on the other side of the room.

24.SUPPORT (filler)

25.CHARGE (target)

SC-sense: to say publicly that you think someone has done something wrong

Demonstrators have charged that the police used excessive force against them.

DO-sense: to ask someone for a particular amount of money for something you are selling

The hotel charges $125 a night.

26.ENCOURAGE (filler)

27. OBSERVE (target)

SC-sense: to discover, to determine the existence or presence of something

Doctors have observed that 40% of the patients have high blood pressure.

APPENDIX-3. (Continued) Two Senses and Sample Sentences of the Target Verbs and Verbs Used in the Filler Items in the Pilot Study

DO-sense: to follow with the eyes or the mind, to watch

One student performs the experiment, while his partner observes him.

28. ENCOUNTER (filler)

29. PROJECT (target)

SC-sense: to calculate what something will be in the future, to make a guess about the future based on the information you have

The decade ahead was one in which it was projected that there would be no growth in the Department of Health and Social Security.

DO-sense: to show a film or other image on a screen or a wall

She projected the slide onto the wall.

30.PROPOSE

31.RECALL (target)

SC-sense: to remember a particular fact, event or situation from the past

I seem to recall that I've seen her somewhere before.

DO-sense: to order the return of someone or something

The company executives recalled thousands of jars of baby food after a salmonella scare.

32. PRETEND (filler)

33. RECOGNIZE (target)

SC-sense: to be fully aware or cognizant of, to accept or admit that something is true

One must recognize that homesickness is natural.

DO-sense: to know who someone is or what something is, because you have seen, heard, experienced or learned about them I the past

I didn't recognize you in your uniform.

34. SUSPECT (filler)

35. REFLECT (target)

SC-sense: to think carefully about something or to say something that you have been thinking about

On the way home he reflected that the interview had gone well.

APPENDIX-3.(Continued) Two Senses and Sample Sentences of the Target Verbs and Verbs Used in the Filler Items in the Pilot Study

DO-sense: If a surface reflects light, heat, sound, or an image, it sends the light, etc. back and does not absorb it

The windows reflected the bright afternoon sunlight.

36. DOUBT (filler)

37. REPORT (target)

SC-sense: to give an account or representation of something in words

Journalists in Cairo reported that seven people had been shot.

DO-sense: to announce something to the proper authority

I'd like to report a theft to the police.

38. REPEAT (filler)

39. REVEAL (target)

SC-sense: to give someone a piece of information that was previously secret

He revealed that the company made a loss of 20 million dollars last year.

DO-sense: to allow something to be seen that, until then, had been hidden

The curtain opened to reveal the grand prize.

40.CONFESS (filler)

41.ACCEPT (target)

SC-sense: to consider, hold or judge something as true, to accept an argument

You need to accept that most of your problems are caused by jealousy.

DO-sense: to take something that someone offers you

He accepted the invitation to stay with us.

42.PROVE (filler)

43.ANNOUNCE (target)

SC-sense: to make something known, to announce publicly or officially

He stood up and announced that he was ready to go.

DO-sense: to give the name of

The government has announced plans to create 10.000 new jobs.

44. FORGET (filler)

45. BELIEVE (target)

SC-sense: to think that something is true or possible, although you are not completely sure

Detectives believe that the victim knows his killer.

APPENDIX-3. (Continued) Two Senses and Sample Sentences of the Target Verbs and Verbs Used in the Filler Items in the Pilot Study

DO-sense: to credit with veracity, to accept as true, to trust

I believed him even though his story sounded unlikely.

46. UNDERSTAND (filler)

47. PREDICT (target)

SC-sense: to tell in advance

Newspapers predicted that Davis would be re-elected.

DO-sense: to indicate by signs

These dark clouds predict rain.

48.PROTEST (filler)

49.SUGGEST (target)

SC-sense: to tell someone your ideas about what they should do, where they should go, etc.

I suggest that you phone before you go round there.

DO-sense: to indicate, to imply

Trends in spending and investment suggest a gradual economic recovery.

50. WARN (filler)

51. IMPLY (target)

SC-sense: to suggest that something is true, without saying this directly

She hadn't meant to imply that he was lying.

DO-sense: to suggest something as a logical consequence

High profits don't necessarily imply efficiency.

52.ARGUE (filler)

53.ASSUME (target)

SC-sense: to think that something is true though you do not have definite proof

I didn't see your car, so I assumed you had gone out.

DO-sense: to start to have control, responsibility, etc.

Jim will assume the role of managing director.

54.REGRET

55.REALIZE (target)

SC-sense: to know and understand something

I suddenly realized that the boy was crying.

APPENDIX-3. (Continued) Two Senses and Sample Sentences of the Target Verbs and Verbs Used in the Filler Items in the Pilot Study

DO-sense: to achieve something you were hoping to achieve

She never realized her ambition of winning an Olympic gold medal.

56.SEE (filler)

57.DENY (target)

SC-sense: to say that something is not true or you do not believe it

We cannot deny that we need to devote more resources to this problem.

DO-sense: to refuse to allow someone to have or do something

The goalkeeper denied him his third goal.

58.PUNISH (filler)

59.ESTABLISH (target)

SC-sense: to find out facts that will prove that something is true

The autopsy established that he had been murdered.

DO-sense: to start a company, organization, etc. that is intended to exist for a long time, to found

Our goal is to establish a new research centre in the north.

60.GUESS (filler)

61. MAINTAIN (target)

SC-sense: to claim that something is true

Critics maintain that these reforms will lead to a decline in educational standards.

DO-sense: to make something continue in the same way or at the same standard as before

Careers officers maintain contact with young people when they have left school.

62. ADVOCATE (filler)

63. EMPHASIZE (target)

SC-sense: to say something in a strong way

The Prime Minister emphasized that there are no plans to raise taxes.

DO-sense: to make something more noticeable

The dress emphasized the shape of her body.

64. DEMONSTRATE (filler)

65. URGE (target)

SC-sense: to strongly suggest that someone does something

He urged that a referendum should be held by December.

APPENDIX-3. (Continued) Two Senses and Sample Sentences of the Target Verbs and Verbs Used in the Filler Items in the Pilot Study

DO-sense: to make someone or something move by pushing, shouting, etc.

He urged the woman forward, his hand under her elbow.

66.PROVIDE (filler)

67.DISCOVER (target)

SC-sense: to find out something that you didn't know about before

She discovered that she was pregnant.

DO-sense: to find someone or something, either by accident or because you were looking for them

They discovered the body in a field.

68. DESCRIBE (filler)

69. FIGURE (target)

SC-sense: to form a particular opinion after thinking about a situation

From the way he behaved, I figured that he was drunk.

DO-sense: to calculate an amount

I'm just figuring my expenses.

70. QUESTION (filler)

71. DICTATE (target)

SC-sense: to tell somebody exactly what they must do

Islamic custom dictates that women should be fully covered.

DO-sense: to say out loud for the purpose of recording

She is dictating a letter to her secretary right now.

72.ANALYZE (filler)

73.HOLD (target)

SC-sense: to have a particular opinion or belief

The judge held that the child's interests in this case must come first.

DO-sense: to have something in your hand or arms

She was holding a knife in one hand.

74. EXPECT (filler)

APPENDIX-3. (Continued) Two Senses and Sample Sentences of the Target Verbs and Verbs Used in the Filler Items in the Pilot Study

75. RESOLVE (target)

SC-sense: to make a definite decision to do something

Mary resolved that she would stop smoking)

DO-sense: to find a satisfactory way of dealing with a problem, to solve

Barnet was desperate for money to resolve his financial problems.

76.APPRECIATE (filler)

APPENDIX-4. Sentence Fragments Used in the Pilot Study

Write down the first completion that comes to your mind.

1. He acknowledged____
2. He stated ____
3. He added ____
4. He decided ____
5. He admitted ____
6. He commanded ____
7. He anticipated ____
8. He reminded ____
9. He bet ____
10. He learnt ____
11. He claimed ____
12. He ordered____
13. He confirmed ____
14. He allowed____
15. He declared____
16. He accused ____
17. He felt____
18. He examined____
19. He found____
20. He determined____
21. He grasped____
22. He taught ____
23. He indicated____
24. He supported ____
25. He charged ____
26. He encouraged____
27. He observed ____
28. He encountered ____
29. He projected ____
30. He proposed ____
31. He recalled ____

APPENDIX-4. (Continued) Sentence Fragments Used in the Pilot Study

32. He pretended____
33. He recognized ____
34. He suspected____
35. He reflected ____
36. He doubted ____
37. He reported ____
38. He repeated ____
39. He revealed ____
40. He confessed ____
41. He accepted ____
42. He proved ____
43. He announced ____
44. He forgot ____
45. He believed ____
46. He understood ____
47. He predicted ____
48. He protested ____
49. He suggested ____
50. He warned ____
51. He implied ____
52. He argued ____
53. He assumed ____
54. He regretted ____
55. He realized ____
56. He saw ____
57. He denied ____
58. He punished ____
59. He established ____
60. He guessed ____
61. He maintained ____
62. He advocated ____
63. He emphasized ____

APPENDIX-4. (Continued) Sentence Fragments Used in the Pilot Study

64. He demonstrated ______________________________

65. He urged ______________________________

66. He provided ______________________________

67. He discovered ______________________________

68. He described ______________________________

69. He figured ______________________________

70. He questioned ______________________________

71. He dictated ______________________________

72. He analyzed ______________________________

73. He held ______________________________

74. He expected ______________________________

75. He resolved ______________________________

76. He appreciated ______________________________

APPENDIX-5. Hare et al.'s (2003) Results of Multi-Corpus Analysis for the Overall Biases of 17 of the Polysemous Verbs Included in the Present Study

Percentages of SC, DO and Other structures

VERB	**BROWN**			**WSJ**			**WSJ87 / BLLIP**			**SWITCHBOARD**		
	SC	***DO***	***OTH***	***SC***	***DO***	***OTH***	***SC***	***DO***	***OTH***	***SC***	***DO***	***OTH***
add	10	32	58	41	29	29	31	17	52	0	61	39
admit	29	24	47	42	30	28	39	30	31	64	36	0
anticipate	0	55	45	13	63	24	14	45	41	33	33	33
bet	44	11	44	54	13	33	47	16	37	61	9	30
claim	33	34	32	69	22	8	55	20	25	71	29	0
confirm	3	68	29	35	48	17	37	38	25	0	0	0
declare	33	16	51	26	29	45	11	49	40	0	100	0
feel	21	31	48	33	15	52	37	15	48	21	8	71
find	9	60	31	23	47	30	18	46	37	19	45	36
grasp	5	57	38	0	60	40	7	44	49	0	100	0
indicate	39	33	28	58	27	16	66	19	16	100	0	0
observe	16	30	54	46	17	38	21	26	53	0	0	0
recall	19	54	27	23	28	49	10	30	60	0	33	67
recognize	9	65	26	20	52	28	27	48	25	14	86	0
reflect	1	53	46	0	92	8	1	88	11	0	0	0
report	16	18	66	22	61	16	16	41	44	0	67	33
reveal	11	70	19	23	58	19	23	56	21	0	0	0
M	16	45	39	31	40	29	17	37	36	21	33	46

APPENDIX-6. Hare et al.'s (2004) Results of Multi-Corpus Analysis for the Overall Biases of 15 Polysemous Verbs Used in the Present Study

Total Numbers of Occurrences and Percentages of SC and DO structures

VERB	BROWN			WSJ			WSJ87/BLLIP		
	TOTAL	***DO***	***SC***	***TOTAL***	***DO***	***SC***	***TOTAL***	***DO***	***SC***
accept	173	70	2	145	86	3	2200	74	2
admit	90	23	31	64	30	42	1129	25	31
anticipate	31	55	0	69	61	13	666	43	14
claim	92	33	36	123	21	69	2487	14	40
confirm	38	68	3	90	47	36	1468	36	35
declare	91	16	34	87	28	26	1270	46	11
discover	118	40	22	64	36	30	722	34	33
establish	174	55	3	116	72	1	1449	60	2
feel	602	33	22	208	19	34	3180	16	30
indicate	241	33	39	197	26	58	3757	15	53
observe	111	28	15	26	19	42	330	27	21
recall	78	56	17	64	28	22	1083	28	9
recognize	146	65	10	57	54	21	766	46	26
report	169	18	17	664	60	22	8341	38	15
reveal	92	72	10	31	48	29	410	54	22

APPENDIX-7. Hare et al.'s (2003) Results of Multi-Corpus Analysis for the Sense-Contingent Biases of 12 Polysemous Verbs

CONDITION	**SUBCATEGORIZATION TYPE**		
	% DO	*% SC*	*% OTHER*
DO-BIASED SENSE	68	9	23
SC-BIASED SENSE	16	64	20

APPENDIX-8. Results of the Quick Placement Test Administered Before Experiment 1

Part. #	**Score**	**Proficiency Level**	**Part. #**	**Score**	**Proficiency Level**
1	30	Low-Intermediate	**29**	38	Low-Intermediate
2	31	Low-Intermediate	**30**	38	Low-Intermediate
3	31	Low-Intermediate	**31**	38	Low-Intermediate
4	32	Low-Intermediate	**32**	39	Low-Intermediate
5	32	Low-Intermediate	**33**	40	Upper-Intermediate
6	32	Low-Intermediate	**34**	40	Upper-Intermediate
7	32	Low-Intermediate	**35**	40	Upper-Intermediate
8	33	Low-Intermediate	**36**	40	Upper-Intermediate
9	34	Low-Intermediate	**37**	40	Upper-Intermediate
10	34	Low-Intermediate	**38**	40	Upper-Intermediate
11	34	Low-Intermediate	**39**	40	Upper-Intermediate
12	34	Low-Intermediate	**40**	40	Upper-Intermediate
13	34	Low-Intermediate	**41**	40	Upper-Intermediate
14	35	Low-Intermediate	**42**	40	Upper-Intermediate
15	35	Low-Intermediate	**43**	40	Upper-Intermediate
16	35	Low-Intermediate	**44**	40	Upper-Intermediate
17	36	Low-Intermediate	**45**	40	Upper-Intermediate
18	36	Low-Intermediate	**46**	40	Upper-Intermediate
19	36	Low-Intermediate	**47**	41	Upper-Intermediate
20	36	Low-Intermediate	**48**	41	Upper-Intermediate
21	36	Low-Intermediate	**49**	41	Upper-Intermediate
22	36	Low-Intermediate	**50**	41	Upper-Intermediate
23	36	Low-Intermediate	**51**	41	Upper-Intermediate
24	37	Low-Intermediate	**52**	41	Upper-Intermediate
25	37	Low-Intermediate	**53**	41	Upper-Intermediate
26	37	Low-Intermediate	**54**	41	Upper-Intermediate
27	37	Low-Intermediate	**55**	41	Upper-Intermediate
28	38	Low-Intermediate	**56**	41	Upper-Intermediate

APPENDIX-8. (Continued) Results of Quick Placement Test Administered Before Experiment 1

Part. #	Score	Proficiency Level	Part. #	Score	Proficiency Level
57	38	Low-Intermediate	**72**	44	Upper-Intermediate
58	42	Upper-Intermediate	**73**	44	Upper-Intermediate
59	42	Upper-Intermediate	**74**	45	Upper-Intermediate
60	42	Upper-Intermediate	**75**	45	Upper-Intermediate
61	42	Upper-Intermediate	**76**	45	Upper-Intermediate
62	42	Upper-Intermediate	**77**	45	Upper-Intermediate
63	42	Upper-Intermediate	**78**	46	Upper-Intermediate
64	43	Upper-Intermediate	**79**	46	Upper-Intermediate
65	43	Upper-Intermediate	**80**	47	Upper-Intermediate
66	43	Upper-Intermediate	**81**	47	Upper-Intermediate
67	43	Upper-Intermediate	**82**	47	Upper-Intermediate
68	43	Upper-Intermediate	**83**	47	Upper-Intermediate
69	43	Upper-Intermediate	**84**	47	Upper-Intermediate
70	44	Upper-Intermediate	**85**	47	Upper-Intermediate
71	44	Upper-Intermediate			

ALTE LEVEL	TEST SCORE (out of 60)	COUNCIL OF EUROPE LEVEL
0 Beginner	0-17	A1
1 Elementary	18-29	A2
2 Low-Intermediate	30-39	B1
3 Upper-Intermediate	40-47	B2
4 Advanced	48-54	C1
5 Very Advanced	55-60	C2

APPENDIX-9. Sentence Fragments Used in Experiment 1

Write down the first completion that comes to your mind.

1. He admired ______________________________
2. He guessed ______________________________
3. He responded ______________________________
4. He found ______________________________
5. He imagined ______________________________
6. He loved ______________________________
7. He admitted ______________________________
8. He borrowed ______________________________
9. He fell ______________________________
10. He expected ______________________________
11. He indicated ______________________________
12. He argued ______________________________
13. He cleaned ______________________________
14. He reported ______________________________
15. He ate ______________________________
16. He replied ______________________________
17. He arrived ______________________________
18. He added ______________________________
19. He mentioned ______________________________
20. He kicked ______________________________
21. He observed ______________________________
22. He swallowed ______________________________
23. He seemed ______________________________
24. He complained ______________________________
25. He bet ______________________________
26. He promised ______________________________
27. He loaded ______________________________
28. He grasped ______________________________
29. He attended ______________________________
30. He vanished ______________________________

APPENDIX-9. (Continued) Sentence Fragments Used in Experiment 1

31. He insisted ______________________________
32. He recognized ______________________________
33. He doubted ______________________________
34. He invited ______________________________
35. He revealed ______________________________
36. He remained ______________________________
37. He pulled ______________________________
38. He proved ______________________________
39. He established ______________________________
40. He reckoned ______________________________
41. He filled ______________________________
42. He felt ______________________________
43. He lay ______________________________
44. He enjoyed ______________________________
45. He stated ______________________________
46. He confirmed ______________________________
47. He pretended ______________________________
48. He carried ______________________________
49. He reflected______________________________
50. He cut ______________________________
51. He waited ______________________________
52. He repeated ______________________________
53. He discovered ______________________________
54. He explained ______________________________
55. He stole______________________________
56. He claimed ______________________________
57. He loathed ______________________________
58. He revolted ______________________________
59. He commented ______________________________
60. He accepted ______________________________
61. He suggested ______________________________

APPENDIX-9. (Continued) Sentence Fragments Used in Experiment 1

62. He needed ____

63. He recalled____

64. He acted ____

65. He brought ____

66. He remarked ____

67. He declared ____

68. He supposed ____

69. He lost ____

70. He anticipated____

APPENDIX-10. Informed Consent Form

Dear participant,

You are invited to a psycholinguistic research study which aims to investigate EFL learners' use of verb subcategorization bias information in the resolution of temporary ambiguity within the scope of a PhD Dissertation at the Department of Foreign Language Education, Anadolu University. The findings of the research are expected to contribute to the field of foreign language education.

The study involves two sentence completion tests in which you are required to write continuations for the sentence fragments given and an eye-tracking experiment by means of which your eye movements will be monitored and your reading times will be measured while trying to interpret sentences in English. The data collected from sentence completion tasks and the eye-tracking experiment will be compared.

The experiments we would like you to participate in are summarized below:

Experiment 1: Sentence completion task (approximately 35 minutes)

Experiment 2: Sentence completion task (approximately 50 minutes)

Experiment 3: Eye-tracking study (approximately 45 minutes)

The study involves no foreseeable risks or harm to you. Your participation is voluntary, you are under no obligation to participate and you are free to withdraw at any time, without giving any reason. Your credentials and the data obtained from you will be kept strictly confidential and will only be used for this research. The results of the study may be published or presented at professional meetings, but your identity will not be revealed. In order to complete the research successfully, it is essential that you complete all the sentence fragments and read all the sentences in the eye-tracking experiment carefully. You are free to ask questions about the study and the results obtained afterwards, you can contact me via the e-mail address below.

Thank you in advance for your participation and your time.

Instructor Betül CANIDAR
Anadolu University
Department of Foreign Language Education
PhD in English Language Teaching Program
Contact: betulcanidar@gmail.com

APPENDIX-10. (Continued) Informed Consent Form

Certificate of Consent

I have been invited to participate in this research study about EFL learners' use of verb subcategorization information and ambiguity resolution. I confirm that I have read all the details about the study, and I have had the opportunity to ask questions and got satisfactory answers to them.

I voluntarily consent to be a participant in this study.

Date: ……. /…….. / …………

Signature: ……………………………………....

Name: ……………….……………………………

APPENDIX-11. Ethics Committee Approval

Evrak Kayıt Tarihi: 15.03.2017 | Protokol No: 31864

Tarih: 24.03.2017

ANADOLU ÜNİVERSİTESİ
SOSYAL VE BEŞERİ BİLİMLER BİLİMSEL ARAŞTIRMA VE YAYIN ETİĞİ KURULU
KARAR BELGESİ

ÇALIŞMANIN TÜRÜ:	Doktora Tez Çalışması
KONU:	Eğitim Bilimleri
BAŞLIK:	Turkish EFL Learners' Use of Verb Subcategorization Bias Information in English Polysemous Verbs and the Resolution of Temporary Ambiguity Yabancı Dil Olarak İngilizce Öğrenen Türk Öğrencilerin İngilizce Çokanlamlı Eylemlerin Tümleme Seçme Eğilimi Bilgisini Kullanımı ve Geçici Anlam Bulanıklığının Çözülmesi
PROJE/TEZ YÜRÜTÜCÜSÜ:	Prof. Dr. Ümit Deniz TURAN
TEZ YAZARI:	Betül CANIDAR
ALT KOMİSYON GÖRÜŞÜ:	-
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APPENDIX-12. Two Lists Including Biasing Contexts and Sentence Fragments Used in Experiment 2

VERSION 1

Read the sentences and complete the sentence fragments below meaningfully.

1. Jessica, who was a great lover of poetry, knew almost all poems by Shakespeare about life and love by heart. She admired____

____

2. The last time Mary saw Richard, his speech was slower than normal and he couldn't walk properly. Therefore, she guessed ______________________________________

____

3. A researcher conducted a study including 150 teenagers and investigating the possible link between depression and suicide. He found ________________________________

____

4. The estate agent had sent Chris some photos; nevertheless, he was a bit disappointed when he went to Paris and saw the apartment for sale. He had imagined ____________

____

5. When Amy was promoted to a better position, she was a bit sad about having to leave New York and moving to a much smaller town. She really loved __________________

____

6. Due to heavy rain, lots of students couldn't arrive at school on time and had to wait outside the classroom for the professor's permission. Finally, he admitted ___________

____

7. Jessica didn't have an appropriate dress to wear for her graduation party and she didn’t have enough money to buy one, either. Therefore, she borrowed __________________

____

8. The citizens of the two countries were following the peace talks that had been going on in a positive and constructive atmosphere for weeks. They expected _____________

____

9. In a study examining English teachers’ attitudes to the use of technology, 250 teachers were asked to share their experiences. They reported ___________________________

____

APPENDIX-12. (Continued) Two Lists Including Biasing Contexts and Sentence Fragments Used in Experiment 2

10. The experts were strongly opposed to the idea of building a dam in that area because it would increase the risk of flooding. They argued______________________________

____

11. After Jack shot the woman walking in the park to death, he noticed his fingerprints on the gun and took a tissue out of his bag. He cleaned____________________________

____

12. There were many toy cars of different colors in the shop so his parents asked the little boy to show which one he wanted. He indicated _______________________________

____

13. Stephan's doctor advised him to have a balanced, vegetarian diet for about 6 months as it was the only way of overcoming heart diseases. Therefore, he ate _____________

____

14. The prisoners had a worried look on their faces and they repeatedly asked the police officer questions about where they were being taken. Finally, he replied_____________

____

15. Immediately after complaining about the loud music, Max checked out from the hotel, but returned to say one more thing to the manager. He added_____________________

____

16. Brian, a child development specialist, was a guest expert on a TV program last night and warned parents about home accidents. He mentioned_________________________

____

17. When William saw the naughty cat knock a glass of orange juice over his term paper, he exploded with anger. Then, all of a sudden, he kicked_________________________

____

18. Mary and Mike, psychologists examining people's behaviors while strolling among the crowd, sat on a bench in the busiest street in Manhattan for weeks. They observed

____

____

APPENDIX-12. (Continued) Two Lists Including Biasing Contexts and Sentence Fragments Used in Experiment 2

19. Jack's boat overturned during his vacation off the coast of Florida and he was able to swim back to the shore without an obvious problem. However, he swallowed

____

20. Wegener was the scientist who proposed the Continental Drift Theory but small attention was paid to his proposal in his own country. Thus, he complained__________

____

21. David knew Victoria, who was always a latecomer, very well so he did not believe her when she promised to be in the concert hall in a few minutes. He bet____________

____

22. After the mining accident in Chile, the media blamed the company for not taking sufficient safety precautions. Right after these allegations, the government promised

____

____

23. As soon as Emma returned from the business trip and saw the empty fridge, she drove to the supermarket and bought lots of groceries. Then, she loaded

____

____

24. Alexandra was watching Edward walking joyfully in front of her when he was about to fall on the snow-covered, uneven ground. She grasped__________________________

____

25. Mary was invited to her cousin's engagement ceremony on July 5th when she had an important meeting with her sales staff. She unavoidably attended___________________

____

26. Robert was known to have beaten his wife to death and ample evidence was provided by the witnesses during the trial. However, he still insisted_______________________

____

27. Last year, Jack had some health problems and the doctor warned him about smoking, his poor diet and insufficient physical activity. He then recognized

____

____

APPENDIX-12. (Continued) Two Lists Including Biasing Contexts and Sentence Fragments Used in Experiment 2

28. Emily had saved $15.000 when she finally decided to buy a new car, but she was a bit hesitant due to the recent increase in car prices. She doubted___________________

____

29. At first, Jack and Marry had planned a big wedding guest list but the venue that they decided on could be hired out for only 250 people. Thus, they invited______________

____

30. When Bob's sister insisted too much to see the special gift he had bought for their parents' golden anniversary, he gave in and opened the lid of the box. He revealed

____

____

31. Depressed and bored with her life, Julia felt the need to make small changes in her living room and asked Max to help her move the furniture. They first pulled _________

____

32. Stephen was the only suspect who might have attacked the famous actress, but he denied being near the crime scene that night. He finally proved ___________________

____

33. Max examined the previous research on the long-term effects of divorce and conducted a comprehensive study with 1500 participants. He established____________

____

34. Although it wasn't verified by scientists in the 1980s, most of the doctors agreed on the contribution of various factors to ulcer formation. They reckoned_______________

____

35. Robert panicked and didn’t know what to do when a fire suddenly broke out in the office and the first thing he did was to take the bucket near the door. He filled _______

____

36. Darcy’s brother rushed into the room, walked towards her, put his hand on her shoulder and leaned over her so closely. She felt _______________________________

____

37. Martin, a passionate crime fiction lover, had been waiting impatiently for Winslow’s novel and he didn't start reading it until the weekend. He enjoyed _________________

APPENDIX-12. (Continued) Two Lists Including Biasing Contexts and Sentence Fragments Used in Experiment 2

38. The President examined the new traffic law made by the Parliament and he refused to approve it because some improvements were required. He stated____________________

____

39. At the turn of the 20th century, Egyptian archeologists discovered a 7000-year-old lost city along the Nile, which was a thrilling discovery. It confirmed _______________

____

40. Bill was going through a difficult period and had a lot of problems to deal with at workplace; however, he tried not to upset his wife. Therefore, he pretended

____

____

41. It had been a long, tiring day for both Samantha and her three-year-old son, who fell asleep just before they arrived home. Therefore, she carried______________________

____

42. A week before Christmas, Little Johnny's grandmother told him a story about Santa Claus, who brings gifts to all good boys and girls. Therefore, he eagerly anticipated

____

____

43. Julia made a chocolate cake for the guests she was expecting for her son's 6th birthday party but there were more people than expected. Thus, she cut ____________________

____

44. Though Nick turned down Maria's dinner party invitation due to his busy schedule, she didn't give up and called him again on Friday. He patiently repeated____________

____

45. At first, Sara was really disappointed with her son's decision to get a place of his own and live apart from her. However, she then reflected____________________________

____

46. Molly's parents wanted to drive her back to London but her sister had problems with her husband and she didn't want to leave her alone. Thus, she explained ____________

47. Jack, who hadn't eaten anything for the past 3 days, was starving when he saw the bakery across the street. Helpless and hungry, he stole__________________________

APPENDIX-12. (Continued) Two Lists Including Biasing Contexts and Sentence Fragments Used in Experiment 2

48. Just like many others who asked for a refund, Adrian also took the mobile phone he had brought back to the shop as it developed a fault after only two months. He claimed

____

____

49. Emily, an academician, had had stage fright since her childhood and she made great effort to overcome it. Even after years of practice, she still loathed_________________

____

50. Alex and John asked Mr. Adam to decide whose essay was better so he read both of them several times to make the right decision. He then commented_________________

____

51. During the meeting, George pretended to support the idea of having children before getting married but he was obviously lying. Finally, though, he accepted____________

____

52. It was the third time the Brown family's house had been broken into. Their son, Martin, decided to find a way to protect their home. Thus, he suggested_____________

____

53. Dave was working under great pressure as he had to complete the project until May so he suddenly started to suffer from severe headaches. He obviously needed ________

____

54. Just after a period of 6 months, the company diagnosed engine problems in more than 70% of the new cars. Thus, it recalled____

____

55. All history class students decided to go on a picnic on Saturday, shared all tasks and invited Rebecca, who was known as the 'cookie lady', too. So she brought___________

____

56. Jack's failure astonished all members of the parliament as he was known to be a successful politician artful in accomplishing his goals. Thus, most of them remarked

____

____

APPENDIX-12. (Continued) Two Lists Including Biasing Contexts and Sentence Fragments Used in Experiment 2

57. The famous pop star, accused of assaulting a woman whom he had never seen before, held a press conference last week. He declared________________________________

____

58. Dan called Maria three times and left her at least ten messages yesterday; however, she didn't call or text him back till the evening. Therefore, he supposed______________

____

59. Julia spent days preparing a speech for her graduation party and taking notes but nobody could understand why her speech that day was so terrible. She probably lost

____

____

60. A team of NASA scientists were assessing the possibility of the existence of Earth-like, habitable planets that harbor water in the universe. Finally, they discovered

____

____

APPENDIX-12. (Continued) Two Lists Including Biasing Contexts and Sentence Fragments Used in Experiment 2

VERSION 2

Read the sentences and complete the sentence fragments below meaningfully.

1. Jessica, who was a great lover of poetry, knew almost all poems by Shakespeare about life and love by heart. She admired ____

____

2. The last time Mary saw Richard, his speech was slower than normal and he couldn't walk properly. Therefore, she guessed____

____

3. Harry had been looking for a good job since he graduated from the university two years ago and last month he finally succeeded. He found________________________________

____

4. The estate agent had sent Chris some photos; nevertheless, he was a bit disappointed when he went to Paris and saw the apartment for sale. He had imagined ______________

____

5. When Amy was promoted to a better position, she was a bit sad about having to leave New York and moving to a much smaller town. She really loved____________________

____

6. The manager ignored all criticisms and strongly believed in the efficiency of the system until the company suddenly went bankrupt. He then admitted______________________

____

7. Jessica didn't have an appropriate dress to wear for her graduation party and she didn't have enough money to buy one, either. Therefore, she borrowed____________________

____

8. The citizens of the two countries were following the peace talks that had been going on in a positive and constructive atmosphere for weeks. They expected______________

____

9. William's friends knew he was selling drugs and tried to warn him in a subtle way several times but he took no notice of them. They finally reported___________________

____

APPENDIX-12. (Continued) Two Lists Including Biasing Contexts and Sentence Fragments Used in Experiment 2

10. The experts were strongly opposed to the idea of building a dam in that area because it would increase the risk of flooding. They argued______________________________

____

11. After Jack shot the woman walking in the park to death, he noticed his fingerprints on the gun and took a tissue out of his bag. He cleaned ___________________________

____

12. Edward denied cheating on his wife and having fathered another child and he agreed to his wife's request for DNA testing. This indicated_____________________________

____

13. Stephan’s doctor advised him to have a balanced, vegetarian diet for about 6 months as it was the only way of overcoming heart diseases. Therefore, he ate _______________

____

14. The prisoners had a worried look on their faces and they repeatedly asked the police officer questions about where they were being taken. Finally, he replied______________

____

15. Max spent years writing a biology textbook; however, it didn’t have enough sales due to the lack of variety and interesting visuals. He thus added_______________________

____

16. Brian, a child development specialist, was a guest expert on a TV program last night and warned parents about home accidents. He mentioned_________________________

____

17. When William saw the naughty cat knock a glass of orange juice over his term paper, he exploded with anger. Then, all of a sudden, he kicked__________________________

____

18. A group of researchers conducted a study to investigate the probable relationship between diabetes and high blood pressure. They observed_________________________

____

19. Jack’s boat overturned during his vacation off the coast of Florida and he was able to swim back to the shore without an obvious problem. However, he swallowed

____

APPENDIX-12. (Continued) Two Lists Including Biasing Contexts and Sentence Fragments Used in Experiment 2

20. Wegener was the scientist who proposed the Continental Drift Theory but small attention was paid to his proposal in his own country. Thus, he complained ____

____

21. Austin, who was experiencing bad luck in horse-racing, was left with just $100 but he decided to take a risk as the horse named 'Lucky' had come first in the last five races. He bet ____

____

22. After the mining accident in Chile, the media blamed the company for not taking sufficient safety precautions. Right after these allegations, the government promised ____

____

23. As soon as Emma returned from the business trip and saw the empty fridge, she drove to the supermarket and bought lots of groceries. Then, she loaded ___________________

____

24. Lying in her bed thinking about the argument she had with her father, Jane began to understand why he was so angry with her. She grasped ___________________________

____

25. Mary was invited to her cousin's engagement ceremony on July 5th when she had an important meeting with her sales staff. She unavoidably attended ___________________

____

26. Robert was known to have beaten his wife to death and ample evidence was provided by the witnesses during the trial. However, he still insisted ________________________

____

27. When Jack went into the cafe, he could not immediately notice his ex-girlfriend sitting at a table near the window as she had changed a lot. He then recognized ____

____

APPENDIX-12. (Continued) Two Lists Including Biasing Contexts and Sentence Fragments Used in Experiment 2

28. Emily had saved $15.000 when she finally decided to buy a new car but she was a bit hesitant due to the recent increase in car prices. She doubted______________________

____

29. At first, Jack and Marry had planned a big wedding guest list but the venue that they decided on could be hired out for only 250 people. Thus, they invited_______________

____

30. Although Bob had refused to talk about it many times before, his girlfriend again asked him why he had been kept in prison for some time. Finally, he revealed

____

____

31. Depressed and bored with her life, Julia felt the need to make small changes in her living room and asked Max to help her move the furniture. They first pulled

____

____

32. Stephen was the only suspect who might have attacked the famous actress but he denied being near the crime scene that night. He finally proved ___________________

____

33. William produced a series of crime novels which were aimed towards black audiences but he failed to find a supportive publishing company. He thus established

____

____

34. Although it wasn't verified by scientists in the 1980s, most of the doctors agreed on the contribution of various factors to ulcer formation. They reckoned________________

____

35. Robert panicked and didn't know what to do when a fire suddenly broke out in the office and the first thing he did was to take the bucket near the door. He filled ________

____

36. Sale of illegal drugs was a serious problem in schools and most parents complained about the lack of necessary measures. They felt________________________________

____

APPENDIX-12. (Continued) Two Lists Including Biasing Contexts and Sentence Fragments Used in Experiment 2

37. Martin, a passionate crime fiction lover, had been waiting impatiently for Winslow's novel and he didn't start reading it until the weekend. He enjoyed_________________

____

38. The President examined the new traffic law made by the Parliament and he refused to approve it because some improvements were required. He stated__________________

____

39. Having booked a room at a hotel in Havana, Jack was packing for his vacation when the receptionist called to ask if he would arrive on the scheduled day and time . Thus, he confirmed ____

____

40. Bill was going through a difficult period and had a lot of problems to deal with at workplace; however, he tried not to upset his wife. Therefore, he pretended __________

____

41. It had been a long, tiring day for both Samantha and her three-year-old son, who fell asleep just before they arrived home. Therefore, she carried______________________

____

42. The country would have suffered an economic disaster if the economists hadn't realized the forthcoming danger and taken the necessary measures. They had anticipated

____

____

43. Julia made a chocolate cake for the guests she was expecting for her son's 6th birthday party but there were more people than expected. Thus, she cut____________________

____

44. Though Nick turned down Maria's dinner party invitation due to his busy schedule, she didn't give up and called him again on Friday. He patiently repeated______________

____

45. Sara wanted to get the great view of Lake Montana out of her front window so she set up a huge mirror in the living room of her new apartment. She reflected_______________

____

APPENDIX-12. (Continued) Two Lists Including Biasing Contexts and Sentence Fragments Used in Experiment 2

46. Molly's parents wanted to drive her back to London but her sister had problems with her husband and she didn't want to leave her alone. Thus, she explained______________

____

47. Jack, who hadn't eaten anything for the past 3 days, was starving when he saw the bakery across the street. Helpless and hungry, he stole___________________________

____

48. The therapist was confident in his ability to cure sleeping disorders in a very short time although they are usually thought to be incurable. He claimed_________________

____

49. Emily, an academician, had had stage fright since her childhood and she made great effort to overcome it. Even after years of practice, she still loathed_________________

____

50. Alex and John asked Mr. Adam to decide whose essay was better so he read both of them several times to make the right decision. He then commented_________________

____

51. They invited George to the opening-night party and at first he refused to join them after all those arguments they had had. Finally, though, he accepted________________

____

52. It was the third time the Brown family's house had been broken into. Their son, Martin, decided to find a way to protect their home. Thus, he suggested_____________

____

53. Dave was working under great pressure as he had to complete the project until May so he suddenly started to suffer from severe headaches. He obviously needed_________

____

54. The girl who came to Henry’s office yesterday in order to consult him on the new tax law looked quite familiar to him but he didn’t know why. He then recalled____________

____

55. All history class students decided to go on a picnic on Saturday, shared all tasks and invited Rebecca, who was known as the 'cookie lady', too. So she brought_____________

____

APPENDIX-12. (Continued) Two Lists Including Biasing Contexts and Sentence Fragments Used in Experiment 2

56. Jack's failure astonished all members of the parliament as he was known to be a successful politician artful in accomplishing his goals. Thus, most of them remarked____

____

57. The results of the election that showed Trump got the highest votes were sent to the election board and a ceremony was held two weeks later. On that day, they declared

____

____

58. Dan called Maria three times and left her at least ten messages yesterday; however, she didn't call or text him back till the evening. Therefore, he supposed _____________

____

59. Julia spent days preparing a speech for her graduation party and taking notes but nobody could understand why her speech that day was so terrible. She probably lost

____

____

60. At first, Rebecca thought she was the best candidate for the job and she would be able to get it. However, she later discovered____

____

APPENDIX-13. Consent Form for Participation in a Research Study at UMASS Amherst

Principal Investigator: Adrian Staub, PhD

Study Title: Linguistic Effects on eye movements in reading

1. WHAT IS THIS FORM?

This form is called a Consent Form. It will give you information about the study so you can make a decision about participation in this research study.

2. WHO IS ELIGIBLE TO PARTICIPATE?

In order to be eligible to participate in this experiment, you should be between the ages of 18 and 35, and a native speaker of English.

3. WHAT IS THE PURPOSE OF THIS STUDY?

The purpose of this study is to investigate the normal processes involved in comprehending English sentences. We are interested in determining how properties of words and sentence structure influence comprehension.

4. WHERE WILL THE STUDY TAKE PLACE AND HOW LONG WILL IT LAST?

The experiment will take place in Tobin 206. The session you participate in will last between 30 and 45 minutes.

5. WHAT WILL I BE ASKED TO DO?

You will read English sentences and answer occasional questions about them. Your eye movements will be measured, using a completely safe infrared video camera system. You should read in a normal manner, trying to comprehend the sentences you read. You are free to work at your own pace. You are free not to answer any question that you prefer to not answer.

6. WHAT ARE MY BENEFITS OF BEING IN THIS STUDY?

You may not directly benefit from this research; however, we hope that your participation in the study may help us better understand the processes involved in language comprehension.

7. WHAT ARE MY RISKS OF BEING IN THIS STUDY?

There are no known risks associated with this research study.

Initials _____

8. HOW WILL MY PERSONAL INFORMATION BE PROTECTED?

The following procedures will be used to protect the confidentiality of your study records. The researchers will keep all paper study records (including any codes to your data) in a locked filing cabinet. Data files will be labeled with a code. A master key that links names and codes will be maintained in a separate and secure location. All electronic files (e.g. database, spreadsheet, etc.) containing identifiable information will be password protected. Any computer hosting such files will also have password protection to prevent access by unauthorized users. Only the members of the research staff will have access to the passwords. At the conclusion of this study, the researchers may publish their findings. Information will be presented in summary format and you will not be identified in any publications or presentations.

9. WILL I RECEIVE ANY PAYMENT FOR TAKING PART IN THE STUDY?

You will not receive payment. You will be awarded 1 credit if the duration of your participation is 45 minutes or less; the reward for 46-75 minutes of participation is 2 credits. The maximum amount of credit a subject can earn in this study is 2 credits. You should understand, however, that this is not the only way to earn extra credit. You may contact your instructor who will offer you an appropriate alternative activity. Your participation in the experiment is voluntary and you can withdraw at any time without penalty. You will still get credit.

10. WHAT IF I HAVE QUESTIONS?

If you have further questions about this project or if you have a research-related problem, you may contact the principal investigator, Adrian Staub, at astaub@psych.umass.edu, or at 413-545-5925. If you would like to speak with someone not directly involved in the research study, you may contact the Human Research Protection Office at the University of Massachusetts via email at humansubjects@ora.umass.edu; telephone at (413) 545-3428; or mail (Office of Human Research Protection, University of Massachusetts Amherst, Venture Way Center, 100 Venture Way, Amherst, MA 01035). You may also contact the Chair of the Psychology Department, Dr. Caren Rotello, at caren@psych.umass.edu, or call 413-545-2387.

11. CAN I STOP BEING IN THE STUDY?

You do not have to be in this study if you do not want to. If you agree to be in the study, but later change your mind, you may drop out at any time. There are no penalties or consequences of any kind if you decide that you do not want to participate.

12. WHAT IF I AM INJURED?

The University of Massachusetts does not have a program for compensating subjects for injury or complications related to human subjects research, but study personnel will assist you in getting treatment.

13. SUBJECT STATEMENT OF VOLUNTARY CONSENT

I have read this form and decided that I will participate in the project described above. The general purposes and particulars of the study as well as possible hazards and inconveniences have been explained to my satisfaction. I understand that I can withdraw at any time.

____________________ ____________________ _______________

Participant Signature Print Name Date

By signing below, I indicate that the participant has read and, to the best of my knowledge, understands the details contained in this document and has been given a copy.

____________________ ____________________ _______________

Signature of person obtaining consent Print Name Date

Initials _____

APPENDIX-14. Consent Form for Participation in Experiment 3 (for L2 speakers at METU)

Dear participant,

You are invited to a psycholinguistic research study which aims to investigate EFL learners' use of verb subcategorization bias information in the resolution of temporary ambiguity within the scope of a PhD Dissertation at the Department of Foreign Language Education, Anadolu University. The findings of the research are expected to contribute to the field of foreign language education.

The study involves an eye-tracking experiment by means of which your eye movements will be monitored and your reading times will be measured while trying to interpret sentences in English. The experiment we would like you to participate in will last approximately 40 minutes and then you will be given a quick placement test that takes about 25 minutes.

The study involves no foreseeable risks or harm to you. Your participation is voluntary, you are under no obligation to participate and you are free to withdraw at any time, without giving any reason. Your credentials and the data obtained from you will be kept strictly confidential and will only be used for this research. The results of the study may be published or presented at professional meetings, but your identity will not be revealed. In order to complete the research successfully, it is essential that you read all the sentences in the eye-tracking experiment carefully. You are free to ask questions about the study and the results obtained afterwards, you can contact me via the e-mail address below.

Thank you in advance for your participation and your time.

Instructor Betül CANIDAR
Anadolu University
Department of Foreign Language Education

APPENDIX-14. (Continued) Consent Form for Participation in Experiment 3 (for L2 speakers at METU)

<u>**Certificate of Consent**</u>

I have been invited to participate in this research study about EFL learners' use of verb subcategorization information and ambiguity resolution. I confirm that I have read all the details about the study, and I have had the opportunity to ask questions and got satisfactory answers to them.

I voluntarily consent to be a participant in this study.

Date: ……. /…….. / …………

Signature: ……………………………………....

Name: ……………….…………………………

APPENDIX-15. Stimuli Used in Experiment 3 (Eye-Tracking)

1. FIND

(DO-sense promoting context)

The police were searching for a suspect in connection with a murder, and yesterday they picked up his trail.

They found (that) the man killed his wife and two sons, and then fled to Mexico to avoid arrest.

(SC-sense promoting context)

Dan first seemed like a good candidate to tutor Anna, but then, her parents learned about his troubled past.

They found (that) the man killed his wife and two sons, and so they decided to hire another tutor.

2. ADMIT

(DO-sense promoting context)

Students who were late for school due to heavy rain waited outside as the teacher didn't let them in.

But then, he admitted (that) the students should not be blamed for the weather, so he allowed them to enter.

(SC-sense promoting context)

The teacher initially ignored all criticisms and firmly believed in his old fashioned teaching style.

But then, he admitted (that) the students should not be blamed for poor concentration and he resigned.

3. INDICATE

(DO-sense promoting context)

Beth's father asked her to show him which of the three boys in the classroom had hurt her the previous day.

She indicated (that) the boy had left the room because the teacher asked him to see the school principal.

APPENDIX-15. (Continued) Stimuli Used in Experiment 3 (Eye-Tracking)

(SC-sense promoting context)

Eve was telling Kim what happened when she asked the boy she fell in love with out to dinner.

She indicated (that) the boy had left the room because her offer made him furious for no apparent reason.

4. REPORT

(DO-sense promoting context)

When the football player swore at the referees, they threatened to take him to the player behavior committee.

They reported (that) the man went into a panic and left the field in tears in the middle of the game.

(SC-sense promoting context)

The journalists at the crime scene were ready to give details about the latest crime of the serial bank robber.

They reported (that) the man went into a panic when a customer pulled his gun out and fired it into the air.

5. ADD

(DO-sense promoting context)

Hesitant to put Liz's name on the waiting list for new apartments, Bob told his son to give him back the list.

He added (that) his friend was not happy with the cleaning service in her current place, so she wanted to move.

(SC-sense promoting context)

Max complained about the loud music and checked out of the hotel, but returned to say one more thing.

He added (that) his friend was not happy with the cleaning service and she would also leave the hotel early.

APPENDIX- 15. (Continued) Stimuli Used in Experiment 3 (Eye-Tracking)

6. OBSERVE

(DO-sense promoting context)

Interested in how people behave in a crowd, Mike spent hours sitting on a bench on a busy street in Boston.

He observed (that) people hardly paid attention to one another while strolling among the crowd.

(SC-sense promoting sense)

Ted examined the relationship between diabetes and lifestyle, and he came up with significant findings.

He observed (that) people hardly paid attention to their health, which led to diabetes.

7. BET

(DO-sense promoting sense)

Eric finally had a really good hand in the poker game when he suddenly found himself without enough cash.

He bet (that) a thousand dollars was not going to be enough for him to stay in the game, so he quit it.

(SC-sense promoting sense)

Eric was horrified to find how seriously both cars were damaged although his friends tried to calm him down.

He bet (that) a thousand dollars was not going to be enough to pay for it all if the insurance didn't cover it.

8. GRASP

(DO-sense promoting context)

May was watching Pat walking joyfully in front of her when she saw him slip on the snow-covered ground.

She grasped (that) her son wanted to stop her from spending so much time on her phone and sought attention.

APPENDIX- 15. (Continued) Stimuli Used in Experiment 3 (Eye-Tracking)

(SC-sense promoting context)

Lying in her bed thinking about the argument she had with Sam, Sue began to understand why he was so angry.

She grasped (that) her son wanted to stop her from being overprotective and he was seeking more freedom.

9. RECOGNIZE

(DO-sense promoting context)

When Jack went into the cafe, he didn't immediately notice Iris with whom he had broken up two years ago.

He then recognized (that) his ex-girlfriend had a series of operations, so she looked completely different.

(SC-sense promoting context)

Jack had ignored Mary's achievements until she was nominated for the Eisner award for best painter last year.

He then recognized (that) his ex-girlfriend had a series of exhibitions and became a famous artist.

10. REVEAL

(DO-sense promoting context)

June's son insisted on seeing the gift she bought for her parents, so she took the box out of the drawer.

She revealed (that) the box was empty and she would put two cruise tickets in it as soon as she got them.

(SC-sense promoting context)

A thief snatched June's purse and jewelry box, and everyone in the group wondered how she kept so calm.

She revealed (that) the box was empty and her money was not in the purse, so there was no need to panic.

APPENDIX- 15. (Continued) Stimuli Used in Experiment 3 (Eye-Tracking)

11. ESTABLISH

(DO-sense promoting context)

Max had always dreamt of being rich, and finally he decided to start a publishing business.
He established (that) publishing companies do not make much money, so he launched a car rental business.

(SC-sense promoting context)

In his study, Max gave 500 publishing company employees a job satisfaction survey and analyzed the results.
He established (that) publishing companies do not make much money, so they can't pay their employees well.

12. FEEL

(DO-sense promoting context)

The earthquake in Nepal was a terrible experience for Tom and his son, who were sleeping in their hotel room.
They just felt (that) the vibrations of the earthquake were too powerful and people were screaming in terror.

(SC-sense promoting context)

The earthquake occurred in an unexpected location so seismologists failed to provide a scientific explanation.
They just felt (that) the vibrations of the earthquake were too powerful to be generated by that fault line.

13. CONFIRM

(DO-sense promoting context)

Bob got a call from Walmart to check if he wanted any changes in the number of business desktop PCs.
He confirmed (that) the order was given online by the manager of his company and no changes were needed.

(SC-sense promoting context)

The owner of the pizza shop asked the cashier if the delivery request had come over the Internet.

He confirmed (that) the order was given online by a woman who didn't provide her name and paid by credit card.

14. REFLECT

(DO-sense promoting context)

Kim wanted to get the view of the lake out of her front window so she set up a huge mirror in her living room.

She reflected (that) the lake could be a good place for a poet to get inspiration, so she felt excited.

(SC-sense promoting context)

Sara, head of the organizing committee, decided to hold their annual meeting at the restaurant by Mono Lake.

She reflected (that) the lake could be a good place to meet friends and have breakfast on such a sunny day.

15. DISCOVER

(DO-sense promoting context)

A team of scientists had been looking for Earth-like, habitable planets that harbor water in the universe.

They discovered (that) a planet must also have a substantial atmosphere and a reasonable spinning rate.

(SC-sense promoting context)

Students of the astrology class were surprised to find differences between planets in astrology and astronomy.

They discovered (that) a planet must also have specific traits representing the will of gods in astrology.

APPENDIX-15. (Continued) Stimuli Used in Experiment 3 (Eye-Tracking)

16. CLAIM

(DO-sense promoting context)

Just after the company agreed to pay back the customers for faulty cell phones, Ann went to the head office.

She claimed (that) the refund had already been deposited to her account, which proved their reliability.

(SC-sense promoting context)

When Rick demanded the promised reimbursement, the secretary looked at the screen with a puzzled expression.

She claimed (that) the refund had already been deposited and he seemed to have withdrawn it from his account.

17. ACCEPT

(DO-sense promoting context)

Lisa and Ray had been dating for years when Ray finally worked up his courage and asked her to marry him.

She accepted (that) the proposal was impressive but she turned it down, knowing she didn't love him enough.

(SC-sense promoting context)

The professor was trying to make an objective assessment and explain why she had rejected Matt's project.

She accepted (that) the proposal was impressive but she foresaw potential problems with its implementation.

18. RECALL

(DO-sense promoting context)

The company executives diagnosed engine trouble in their new cars and held a meeting to decide what to do.

Then, they recalled (that) the cars had arrived in all US showrooms, so they needed to take immediate action.

APPENDIX-15. (Continued) Stimuli Used in Experiment 3 (Eye-Tracking)

(SC-sense promoting context)

The hostage had already been stabbed when two police cars arrived, so Ian and Dan accused them of being late.

Then, they recalled (that) the cars had arrived in the scene sooner than expected given the distance travelled.

19. DECLARE

(DO-sense promoting context)

The council offered a proposal to celebrate the anniversary of the coup on May, 15 and honor the veterans.

They declared (that) a holiday could be a good way of commemorating their victory but some wouldn't accept it.

(SC-sense promoting context)

The school principal informed the parents about another spring break in May but they strongly objected to it.

They declared (that) a holiday could be a good opportunity for children to rest but not before a big test.

20. ANTICIPATE

(DO-sense promoting context)

Some parts of India were gripped by severe drought, so farmers were excited about the coming monsoons.

They anticipated (that) the rains would slow their progress in corn planting but they would be good for wheat.

(SC-sense promoting context)

A group of hikers set out to tackle the Arizona Trail although they were aware of the coming storms.

They anticipated (that) the rains would slow their progress or even stop them but it was worth trying.

APPENDIX-16. Debriefing Form (Experiment 3) - For UMASS Students

Linguistic Effects on Eye Movements in Reading - Debriefing

Thank you very much for your participation in this experiment. We are investigating how people recognize words, how they determine the meanings of sentences, and how these two processes may interact with each other. To do this, we track how the eyes move in reading. It has been known for several decades that eye movements in reading are a very sensitive indicator of processing difficulty; when things get difficult (even if you are not consciously aware of this difficulty), your eyes slow down, or go backwards in the text. As a result, we can use eye movements as a way of assessing what particular factors cause linguistic processing difficulty and can thereby learn something about how language processing works.

In this particular experiment, you may have read sentences in which we manipulated the frequency of critical words (e.g. *house* is more frequent than *cabin*), and their predictability in the contexts in which they appeared (e.g. *cabin* is predictable in *They went to the woods to spend the weekend in their cabin*). You may also have read sentences with complex structures, such as *The reporter who the senator attacked admitted the error*.

If you would like further information, please contact Dr. Adrian Staub at 545-5925 or at astaub@psych.umass.edu. If you have any concerns about your rights as a participant in this study you may contact the Chair of the Psychology Department, Dr. Caren Rotello, at caren@psych.umass.edu, or call 413-545-2387; you may also contact the Human Research Protection Office via email (humansubjects@ora.umass.edu); telephone (413- 545-3428); or mail (Office of Human Research Protection, University of Massachusetts Amherst, Venture Way Center, 100 Venture Way, Amherst, MA 01035).

APPENDIX-17. Debriefing Form (Experiment 3) - For METU Students

Linguistic Effects on Eye Movements in Reading - Debriefing

Thank you very much for your participation in this experiment. We are investigating how people recognize words, how they determine the meanings of sentences, and how these two processes may interact with each other. To do this, we track how the eyes move in reading. It has been known for several decades that eye movements in reading are a very sensitive indicator of processing difficulty; when things get difficult (even if you are not consciously aware of this difficulty), your eyes slow down, or go backwards in the text. As a result, we can use eye movements as a way of assessing what particular factors cause linguistic processing difficulty and can thereby learn something about how language processing works.

In this particular experiment, you may have read sentences in which we manipulated the frequency of critical words (e.g. *house* is more frequent than *cabin*), and their predictability in the contexts in which they appeared (e.g. *cabin* is predictable in *They went to the woods to spend the weekend in their cabin*). You may also have read sentences with complex structures, such as *The reporter who the senator attacked admitted the error*.)

If you would like further information, please contact Betül Canıdar at 535-964-46-70 or at betulcanidar@gmail.com

APPENDIX-18. Verb Sense and SF Preferences of L1 and L2 English Speakers for Each Individual Target Verb in the Absence of Promoting Contexts

Once the overall results of the use of verb sense and SFs for the small set of target verbs were obtained, the distribution of these categories in each target verb were analyzed in order to explain and exemplify the idiosyncratic occurrences with these target verbs. As the preceding contexts generally steered participants towards specific verb senses and SFs, the participants were restricted semantically and syntactically to a certain extent in Experiment 2. That is why the behaviors of individual verbs were examined only when the participants used them out of context. Moreover, the dominant senses and overall biases of these individual verbs were also presented in the detailed analyses. Below are the Pearson Chi-Square statistics provided and the participants' sentence continuations examined more closely on a verb-by-verb basis.

Verb Sense & SF Preferences of L1 and L2 English Speakers for the Verb *ACCEPT*

As revealed by the results of Chi-square tests presented in the table below, a rich variety of verb senses and SFs were selected by both groups of participants when they were required to use the verb *accept* in a sentence. Some differences between the preferences of L1 and L2 speakers were also visible. The results showed that the most commonly preferred category by both participant groups was DOS-DO, with a statistically significant difference between L1 and L2 speakers. It is obvious that L1 speakers used DO arguments following DO-biased senses a lot more frequently than L2 speakers (*L1 speakers:* 75% vs. *L2 speakers*: 50%). Furthermore, they differed considerably in their use of SCS-SC constructions, with L2 speakers having a stronger inclination towards using them. Continuations that fell into the SCS-DO category were also fairly frequent in both groups. Another category L1 and L2 speakers differed was DOS-Other. L2 English speakers tended to use them in almost 11% of their completions, whereas there were no such constructions in L1 speaker data.

APPENDIX-18. (Continued) Verb Sense and SF Preferences of L1 and L2 English Speakers for Each Individual Target Verb in the Absence of Promoting Contexts

Verb Sense &SF Preferences of L1 and L2 English Speakers for the Verb ACCEPT

	GROUP				
	L2 Speakers		L1 Speakers		
SENSE & SF	**N**	**%**	**N**	**%**	**[a]p**
DOS-DO	50	50,5	30	75,0	0,008**
SCS-SC	18	18,2	1	2,5	0,015*
SCS-DO	16	16,2	7	17,5	0,848
SCS-OTHER	0	,0	1	2,5	0,114
DOS-OTHER	11	11,1	0	,0	0,028*
DIF-S	0	,0	1	2,5	0,114
INCORRECT	4	4,0	0	,0	0,197

[a]Pearson Chi-Square *$**p<0,01$* *$*p<0,05$*

As to the dominant sense and the overall bias of *accept*, a high level of congruence in L1 and L2 speakers' preferences was revealed. In both groups, DO-biased sense was dominant (*L2 speakers:* 61% vs. *L1 speakers:* 75%). Likewise, its overall structural bias was found to be DO. DO arguments were used by L1 speakers in 95% of their continuations, while their percentage was 66% in L2 dataset.

In sentence completions within the DOS-DO category, the most commonly used DO arguments displayed similarities in both groups and some of them were *offer*, *proposal*, *deal*, *challenge, apology, award* and *invitation*. In the SCS-DO category, *fault, crime, blame* and *defeat* were some of the most common words used by L2 speakers, while L1 speakers usually completed the fragments using *responsibility, loss* and *defeat* following the verb *accept*.

As for the erroneous sentences produced by L2 speakers, problems with using prepositions and the confusions about the uses of *accept, admit* and *agree* appear to be the root causes. As a result, sentences like *"He accepted going with his father to the playground"*, *"He accepted to be guilty"* and *"He accepted to the job for his children"* were formed.

APPENDIX-18. (Continued) Verb Sense and SF Preferences of L1 and L2 English Speakers for Each Individual Target Verb in the Absence of Promoting Contexts

Verb Sense & SF Preferences of L1 and L2 English Speakers for the Verb *ADD*

As revealed by the test statistics presented in the table below, L1 and L2 speakers of English had a lot in common in terms of their verb sense & SF choices following the verb *add*. In both groups of participants, the most frequently preferred category was DOS-DO, and SCS-SC constructions ranked second. No statistically significant differences in the use of these two types of constructions were observed. The only category in the use of which L1 and L2 speakers diverged considerably was DIF-S (p=0,001). In other words, in 22% of the L1 speaker continuations, a different sense of *add* was used, whereas L2 speakers tended to use its SC-biased and DO-biased senses only. Another point is that only L2 speakers produced sentence continuations that fell into SCS-DO, SCS-Other and DOS-Other categories though their percentages are negligible.

Verb Sense & SF Preferences of L1 and L2 English Speakers for the Verb ADD

	GROUP				
	L2 SPEAKERS		**L1 SPEAKERS**		
SENSE & SF	**N**	**%**	**N**	**%**	**[a]p**
DOS-DO	81	81,8	29	72,5	0,221
SCS-SC	8	8,1	2	5,0	0,525
SCS-DO	3	3,0	0	,0	0,266
DOS-OTHER	2	2,0	0	,0	0,365
SCS-OTHER	3	3,0	0	,0	0,266
INCORRECT	2	2,0	0	,0	0,365
DIF-S	0	,0	9	22,5	0,001**

[a]*Pearson Chi-Square* ***p<0,01*

The similarities in two groups' verb sense & SF preferences are also reflected in the dominant sense and the overall bias of *add*. In both L1 and L2 speaker datasets, DO-sense was the dominant one, with a stronger degree of dominance in L2 speakers (*L1 speakers:* 72%; *L2 speakers:* 83%). As for the participants' structural preferences, the numbers and percentages of DO arguments following *add* were substantially higher compared to SC arguments in both groups (*L1 speakers:* 82%; *L2 speakers:* 84%).

A closer examination of the sentence continuations demonstrated that nearly half of the DOS-DO constructions produced by both groups included food-related words such as *sugar, milk, salt, spice* and *water* (*L1 speakers:* 44%; *L2 speakers:* 45%). Furthermore, 6% of L2 and 10% of L1 English speaker continuations that belonged to the DOS-DO category were observed to be related to social media. For example, sentences like *"He added me on Facebook"* and *"He added a comment on Facebook"* could be observed in both datasets. As to the completions categorized as SCS-Other, they were used only by L2 speakers and all of these continuations were quotations such as *"He added: 'I wasn't even there at that time"*. In addition, L1 speakers displayed an inclination towards using two different senses of *add*. In 55% of their continuations that belonged to the DIF-S category, they selected the mathematical sense of the verb and produced sentences like *"He added and subtracted well"* and *"He added two and two together"*. In the remaining 44,5% of them, they preferred the sense "to make a feeling or quality stronger". For example, completions such as *"He added to the deficit"* and *"He added to his reputation"* were categorized as DIF-S. Finally, half of L2 speakers' erroneous continuations resulted from incorrect uses of prepositions (e.g. *He added his list to buy a chocolate*).

Verb Sense & SF Preferences of L1 and L2 English Speakers for the Verb *ADMIT*

The findings revealed that SCS-SC and SCS-DO categories were the most frequent ones in both groups of participants, and that no statistically significant differences were found between L1 and L2 speakers in their use of structures that fell into these two categories (p= 0,735 and p= 0,963, respectively). However, as can be seen from the table below, some significant differences could be observed in their preferences of SCS-Other structures (p=0,038; p<0,05) as well as in the occurrence of INCORRECT (p=0,028; p<0,05) sentence continuations. This demonstrated that, in comparison to L1 speakers, L2 English speakers had a stronger tendency towards *Other* constructions such as gerunds or prepositional phrases following *admit*. Also, 11% of their continuations were found to include erroneous argument structures.

Data from both groups of participants demonstrated that the dominant sense of *admit* was the SC-biased one in both groups (*L1 speakers:* 100% vs. *L2 speakers:* 88% vs.). Likewise, regardless of the verb sense, the inclination of both L1 and L2 speakers towards using SC arguments following *admit* was almost equally strong (*L1 speakers:* 57% vs. *L2 speakers:* 60%).

Verb Sense & SF Preferences of L1 and L2 English Speakers for the Verb ADMIT

	GROUP				
	L2 SPEAKERS		L1 SPEAKERS		
SENSE & SF	**N**	**%**	**N**	**%**	**[a]p**
SCS-SC	60	60,6	23	57,5	0,735
SCS-DO	17	17,2	7	17,5	0,963
SCS-OTHER	11	11,1	10	25,0	0,038*
INCORRECT	11	11,1	0	,0	0,028*

[a]*Pearson Chi-Square* *$p<0,05$

A closer examination of the continuations indicated that 73% of L2 speakers' and 47% of L1 speakers' SCS-SC continuations included vocabulary related to crime (e.g. *steal, kill, cheat, commit, murderer, guilty, crime, wrong, fault* and so on). Similarly, the participants who selected SCS-DO constructions also seemed to frequently use crime vocabulary (e.g. *crime, guilt, fault, mistake*) as the percentages of the continuations including these vocabulary items are 57% for L1 and 88% for L2 speakers of English.

Another frequently selected category by both groups was SCS-Other. In this category, L2 speakers mostly used *admit + Ving* (63%), *admit + to + Ving* (9%), *admit + to + NP* (9%), and *admit + Wh-S* (18%) continuations. Likewise, L1 speakers completed sentences in this category using *admit + Ving*(10%), *admit + to + Ving* (60%), and *admit + to + NP* (30%).

APPENDIX-18. (Continued) Verb Sense and SF Preferences of L1 and L2 English Speakers for Each Individual Target Verb in the Absence of Promoting Contexts

As for the incorrect uses, the analyses of L2 speakers' errors demonstrated that 81,8% of the erroneous continuations included infinitives. They produced ungrammatical sentences such as *"He admitted to go with his friends"* and *"He admitted to work with them"*, and this is probably because L2 speakers mistook *admit* for *agree* as these two verbs can be denoted by a single verb in Turkish. In addition, in the remaining 27% of these sentences, participants used infinitives but intended to convey a different meaning than the one mentioned above . These sentences like *"He admitted to kill his father yesterday*" seem to include structural errors and the participants used infinitives instead of gerunds. Finally, *admit* was followed by the noun phrases *his suggestion* and *her request* in 18% of the incorrect sentence completions of L2 speakers. It seems that in these cases, these participants mistook *admit* for *accept*. The fact that a single verb in Turkish denotes these two separate English verbs might have led to these erroneous uses.

Verb Sense & SF Preferences of L1 and L2 English Speakers for the Verb *ANTICIPATE*

As the test statistics in the table below demonstrate, L1 and L2 speakers displayed substantial differences in their preferences of sense & SFs of the verb *anticipate*. L2 speakers mostly used the SC-biased sense of this particular verb, whereas L1 speakers preferred the DO-biased one. Thus, statistically significant differences were detected between L1 and L2 speakers' continuations that belonged to DOS-DO, SCS-SC and SCS-DO categories. L1 speakers preferred DOS-DO ($p = 0.001$) and SCS-DO ($p = 0.032$) constructions more often than L2 speakers did, which can be considered substantiating evidence for their general tendency to use DO arguments no matter which sense of the verb was used. On the contrary, a remarkably higher proportion of L2 speaker continuations were categorized as SCS-SC compared to that of L1 speakers' ($p = 0.002$). Also, the percentages of items left blank as well as ambiguous and incorrect completions were higher in L2 speaker data.

APPENDIX-18. (Continued) Verb Sense and SF Preferences of L1 and L2 English Speakers for Each Individual Target Verb in the Absence of Promoting Contexts

No dominant sense could be determined in both datasets. However, they differed in their syntactic preferences and thus, this particular verb was found to have an equi-bias in L2 speakers' continuations (33% SC arguments vs. 24% DO arguments), while its overall bias was DO in L1 speaker data (80% DO arguments).

The examination of DOS-DO continuations revealed that L2 speakers preferred DO arguments such as *the party, the meeting, the sequel* and *good remarks*. Likewise, noun phrases like *the ball, the event, the game* and *the holiday* were quite common in L1 speaker sentence completions. As to the DO arguments in sentences with SC-biased senses of *anticipate*, words with negative meanings were predominant in both groups' continuations (e.g. *problem, trouble, disaster, death, fight, bad weather, something bad, the worst thing,* and so on).

Moreover, the *Other* structures in the continuations of both L1 and L2 speakers in sentences with DO-biased sense were gerunds and L1 speakers used them more frequently (e.g. *He anticipated moving to a new home*). All of the sentences with the SC-biased sense; on the other hand, included wh- clauses (e.g. *He anticipated what problem would come next).*

Verb Sense & SF Preferences of L1 and L2 English Speakers for the Verb ANTICIPATE

	GROUP				
	L2 Speakers		L1 Speakers		
SENSE & SF	**N**	**%**	**N**	**%**	**^{a}p**
DOS-DO	8	8,1	19	47,5	0,001**
SCS-SC	33	33,3	3	7,5	0,002**
SCS-DO	16	16,2	13	32,5	0,032*
SCS-OTHER	1	1,0	2	5,0	0,143
DOS-OTHER	1	1,0	3	7,5	0,038*
NA	12	12,1	0	,0	0,021*
AMB-S	5	5,1	0	,0	0,148
INCORRECT	23	23,2	0	,0	0,001**

[a]Pearson Chi-Square ***p<0,01*

APPENDIX-18. (Continued) Verb Sense and SF Preferences of L1 and L2 English Speakers for Each Individual Target Verb in the Absence of Promoting Contexts

As for the incorrect continuations of L2 speakers, sentences such as *"He anticipated to be a teacher*" included infinitives. The intimate relationship between the meanings of *anticipate* and *expect* may have caused L2 speakers to assume they act similarly in sentence structure. Also, in almost one-third of the erroneous sentences, words such as *event, war, competition* and *meeting* were preceded by the prepositions *in* and *to*. This might have resulted from the phonological similarity between the verbs *anticipate* and *participate*. Finally, 25% of the incorrect sentences contained phrases like *the girl who is crying* and *the man who is crying* preceded by the preposition *with*. It appears that some L2 speakers confused *anticipate* with *symphatize* and adopted its prevalent SF preference.

Verb Sense & SF Preferences of L1 and L2 English Speakers for the Verb *BET*

The analyses of the sentence continuations following the verb *bet* revealed that L1 and L2 speakers considerably differed in their selections of verb senses & SFs. To be more precise, DOS-DO constructions were the most frequent in L1 speakers' sentences and a statistically significant difference was detected between two groups (p=0,001). In that same vein, there was a statistically significant difference between them in the use of SCS-SC constructions. L2 speakers seemed to have a much greater inclination towards opting for SCs in their continuations compared to L1 speakers (p=0,001). As presented in the table below, some remarkable differences were observed in the use of a DIF-SENSE and the occurrence of INCORRECT sentence completions. This indicates that 15% of L2 speakers' sentences were erroneous (p=0,009) compared to no incorrect uses in L2 speaker completions, while in 5% of L1 speakers' continuations, a different sense of *bet* was identified (p=0,025).

APPENDIX-18. (Continued) Verb Sense and SF Preferences of L1 and L2 English Speakers for Each Individual Target Verb in the Absence of Promoting Contexts

Verb Sense & SF Preferences of L1and L2 English Speakers for the Verb BET

	GROUP				
	L2 SPEAKERS		L1 SPEAKERS		
SENSE & SF	**N**	**%**	**N**	**%**	**[a]p**
DOS-DO	8	8,1	23	57,5	0,001**
SCS-SC	52	52,5	3	7,5	0,001**
SCS-DO	1	1,0	1	2,5	0,504
DOS-OTHER	20	20,2	11	27,5	0,349
DIF-S	0	,0	2	5,0	0,025*
INCORRECT	15	15,2	0	,0	0,009**
NA	3	3,0	0	,0	0,266

[a]Pearson Chi-Square   ***p<0,01*   **p<0,05*

Data from both L1 and L2 speakers demonstrated that the dominant sense of *admit* was the DO-biased one among L1 speakers (85% DO-biased sense) but neither sense was prominent enough to be counted as dominant in L2 speaker data. Regardless of the verb sense, two groups of participants displayed totally different preferences as to the use of argument structures. 52% of the L2 speakers used SC arguments following *bet*, whereas L1 speakers mostly chose DO arguments (65% DO arguments).

A closer look at the participants' continuations indicated that 87,5 % of L2 speakers' and 97% of L1 speakers' DOS-DO continuations included vocabulary related to money (e.g. *money, bucks, paycheck, 10 dollars, 50k, so much, fortune, a small sum, whole day's income, life savings* and so on). As for the participants who opted for argument structures *Other* than SCs and DOs, 20% of L2 and 9% of L1 speakers' DOS-Other constructions included no objects (e.g. *"He bet three times"* and *"He bet and lost"*) and some of them were complemented with prepositional phrases (e.g. *"He bet against the rival team"* and *"He bet in betting websites")*. The remaining structures in this category included the preposition *on* following *bet*. Thus, sentences such as *"He bet on the team", "He bet on the horse"* and *"He bet on the poker hand"* comprised 80% of L2 speakers' and 91% of L1 speakers' continuations in the DOS-Other category.

APPENDIX-18. (Continued) Verb Sense and SF Preferences of L1 and L2 English Speakers for Each Individual Target Verb in the Absence of Promoting Contexts

Although there was a small number of participants who selected SCS-DO constructions in both groups, they showed a similarity in that they used direct objects immediately after the verb *bet* (e.g. *He bet his friend that he could do it on his own*).

Finally, it seemed that there were three main factors which led to the incorrect uses of L2 speakers. First, they either failed to use the correct preposition or did not use any prepositions at all. As a result, sentences such as *"He bet for Chelsea", "He bet with him"* and *"He bet Red 32"* comprised 53% of their erroneous sentences. Second, in 13% of these continuations, they tended to use unacceptable structures following *bet* such as *"He bet you to win the lottery"* and *"He bet her"*. Third, in 33% of the incorrect continuations, they appear to have mistaken *bet* for some other verbs such as *beg* and *beat*. As a result, they produced sentences such as *"He bet her husband to forgive him"* and *"He bet Mary a lot of times in this game"*. The phonological similarity these three verbs have might have been a causal factor leading to these errors.

Verb Sense & SF Preferences of L1 and L2 English Speakers for the Verb *CLAIM*

One of the target verbs for the use of which L1 and L2 speakers had broadly similar preferences was *claim*. As shown in the table below, the percentages of constructions in none of the categories yielded statistically significant differences. To be more precise, the SC-biased sense of this particular verb was found to be dominant in both participant groups (*L2 Speakers:* 87%, *L1 Speakers:* 85%). However, a slight difference in the overall bias was detected, and it turned out to be a SC-bias verb in L2
speakers' data (75% SC arguments), whereas it had an equi-bias in L1 speakers' continuations (60% SC and 32% DO). When the percentages of SC and DO arguments are considered; however, it is apparent that SC structures vastly outnumbered DOs though it failed to generate a SC-bias. This was probably due to L1 speakers' stronger tendency to use DO arguments following all verbs that permit DOs.

The most frequently selected category in both groups was SCS-SC and 26% of L2 speaker continuations in this group were thematically related to crime (e.g. *"He claimed that she was innocent"* and *"He claimed that his brother had stolen his money"*).

APPENDIX-18. (Continued) Verb Sense and SF Preferences of L1 and L2 English Speakers for Each Individual Target Verb in the Absence of Promoting Contexts

Verb Sense & SF Preferences of L1 and L2 English Speakers for the Verb CLAIM

	GROUP				
	L2 Speakers		L1 Speakers		
SENSE & SF	**N**	**%**	**N**	**%**	**[a]p**
DOS-DO	8	8,1	6	15,0	0,220
SCS-SC	75	75,8	24	60,0	0,063
SCS-DO	2	2,0	3	7,5	0,116
SCS-OTHER	10	10,1	7	17,5	0,228
DIF-S	1	1,0	0	,0	0,524
NA	2	2,0	0	,0	0,365
INCORRECT	1	1,0	0	,0	0,524

[a]*Pearson Chi-Square*

In the SCS-DO category, L2 speakers produced sentences such as *"He claimed himself a God"*, whereas L1 speakers used nouns such as *foul play* and *innocence* in their completions. Moreover, all of the L1 and L2 speaker continuations within the SCS-Other category included infinitives (e.g. "*He claimed to be rich"*, "*He claimed to be a world champion boxer"*). As to the sentences in the DOS-DO category, words like *land, property, rights* and *baggage* were selected as DO arguments by L2 speakers. On the other hand, L1 English speakers chose words such as *coat, immunity* and *reward.*

Verb Sense & SF Preferences of L1 and L2 English Speakers for the Verb CONFIRM

When L1 and L2 speakers' verb sense & SF selections following the verb *confirm* was observed, it was found that these two groups somewhat differed in the types of constructions they preferred. L2 speakers used SCS-SC constructions in the majority of their completions and they were followed by SCS-DO, DIFF-S, DOS-DO, DOS-SC, SCS-Other and DOS-SC constructions, respectively. On the other hand, L1 speakers mostly opted for constructions that can be categorized as SCS-DO, DOS-DO, SCS-SC, SCS-Other and DIFF-S. In spite of the differences in the order of frequency with which they occurred in two datasets, no statistically significant differences were found between two groups of participants in all but one category. As presented in the table below, the statistical analysis of the data demonstrated that L1 and L2 speakers differed in their use of DOS-DO constructions following the verb *confirm* and that L1 speakers showed an inclination to use these constructions much more frequently compared to L2 speakers (p=0,001).

Verb Sense & SF Preferences of L1 and L2 Speakers of English for the Verb CONFIRM

	GROUP				
	L2 SPEAKERS		**L1 SPEAKERS**		
SENSE & SF	**N**	**%**	**N**	**%**	**[a]p**
DOS-DO	6	6,1	12	30,0	0,001**
SCS-SC	40	40,4	11	27,5	0,153
SCS-DO	26	26,3	15	37,5	0,188
DOS-SC	2	2,0	0	,0	0,365
SCS-OTHER	5	5,1	1	2,5	0,503
DIF-S	8	8,1	1	2,5	0,226
NA	4	4,0	0	,0	0,197
AMB-S	1	1,0	0	,0	0,524
INCORRECT	7	7,1	0	,0	0,084

[a]*Pearson Chi-Square* ***p<0,01*

The findings related to the dominant sense and overall bias of indicated that they were not fully consistent. In other words, both groups of participants tended to use the SC-sense of *confirm*, and 71% of L2 and 67% of L1 English speaker continuations were biased towards the SC-sense. Nevertheless, these groups displayed some dissimilarities in their argument structure preferences. In the sentence completions of L2 speakers, *confirm* turned out to be an EQ-biased verb (32% DO arguments; 42% SC arguments). In contrast, 70% of the L1 speaker continuations included DO arguments, which made it a DO-biased verb.

APPENDIX-18. (Continued) Verb Sense and SF Preferences of L1 and L2 English Speakers for Each Individual Target Verb in the Absence of Promoting Contexts

The analysis of the DOS-DO continuations indicated that all of the DO arguments in these sentences produced by L1 and L2 speakers included vocabulary associated with arrangements (e.g. *reservation, date, tickets, appointment, meeting, departure time, ticket number*). In addition, sentence continuations categorized as SCS-DO showed that both groups used roughly similar vocabulary items as DOs although there were not one-to-one correspondences between their preferences. To exemplify, L2 speakers of English included words such as *news, story, events, speculations, relationship, identity* and *password* in their sentences. In a remarkably similar fashion, L1 speakers used words like *story, assumption, facts, truth, news event* and *plan*. As for the SCS-Other constructions, 40% of L2 speaker continuations that belonged to this category included *wh*-complements (e.g. *He confirmed what his mother said*), another 40% included gerunds (e.g. *He confirmed deleting his bank account*) and the remaining 20% included only an adverb (*He confirmed unwillingly*). Additionally, the intended sense of *confirm* in the completions categorized as DIF-S seemed to be "to approve something officially" and these continuations produced by L2 speakers included words such as *conditions, agreement, transaction* and *friend request*, while the only sentence in this category produced by an L1 speaker was *"He confirmed the payment over the phone"*. Finally, two out of seven incorrect completions produced by L2 speakers included infinitives (e.g. *He confirmed to play in a football team in his hometown*). In three of these completions, they tended to use a pronoun as a direct object followed by either a prepositional phrase (*He confirmed me about thinking Claudia is a liar*) or a sentential complement (*He confirmed me that his wife was pregnant*).

Verb Sense & SF Preferences of L1 and L2 English Speakers for the Verb *DECLARE*

A comparison of L1 and L2 speakers' verb sense and SF preferences of the verb *declare* revealed no statistically significant differences between these two groups in an overwhelming majority of the categories. The most strongly favored constructions by both L1 and L2 speakers were DOS-DO, SCS-SC and SCS-DO, respectively. The only category in which they differed considerably was DIF-S, with L1 speakers using the *"acknowledge possession of something"* sense of *declare*.

Furthermore, neither sense was found to be dominant over the other one. Likewise, in both datasets from the two groups, *declare* was labeled a no-bias verb since no big differences between the percentages of DO and SC arguments were observed.

Verb Sense & SF Preferences of L1 and L2 English Speakers for the Verb DECLARE

	GROUP				
	L2 Speakers		L1 Speakers		
SENSE & SF	N	%	N	%	[a]p
DOS-DO	38	38,4	19	47,5	0,323
SCS-SC	32	32,3	12	30,0	0,790
SCS-DO	18	18,2	4	10,0	0,232
SCS-OTHER	4	4,0	2	5,0	0,801
DIF-S	0	,0	3	7,5	0,006**
NA	5	5,1	0	,0	0,148
INCORRECT	2	2,0	0	,0	0,365

[a]*Pearson Chi-Square* ***p<0,01*

A detailed examination of the DOS-DO continuations demonstrated that 62% of them in L2 speakers' and 60% of them in L1 speakers' sentence completions included the noun *war*. The other commonly preferred nouns were *bankruptcy*, *resignation, victory, independence* and *state of emergency* in both groups' data. Also, *declare* with its SC-sense (i.e. to express thoughts or feelings publicly) was usually followed either by noun phrases such as *his intention, his love for her* or by the reflexive pronoun *himself* (e.g. *He declared himself unhappy*).

As to the *Other* argument structures following the SC-biased sense, L2 speakers added indirect objects between the verb and the following sentential complements (e.g. *He declared to his fans that he stopped singing*) or they used infinitives as in the sentence *"He declared to appear in the newspaper"*. Similarly, L1 speakers used the to-infinitive, and direct quotations following *declare*. Finally, both of the incorrect continuations of L2 speakers contained the objects *me* and *everyone* between the verb and the SCs.

Verb Sense & SF Preferences of L1 and L2 English Speakers for the Verb *DISCOVER*

As revealed by the results of the Chi-square tests in the table below, L1 and L2 speakers performed similarly in their completions including the verb *discover*. No statistically significant differences arose in the predetermined verb sense & SF categories. In both groups, DOS-DO constructions were the most frequent and SCS-SC constructions ranked second. L1 and L2 English speakers' selections of the dominant sense and overall structural bias were; therefore, convergent. In 73% of L2 speakers' and 75% of L1 speakers' continuations, the DO-sense of the verb was used. In a similar manner, DO arguments were chosen in approximately 75% of both participant groups' completions, which indicated that *discover* was strongly DO-biased.

Verb Sense & SF Preferences of L1 and L2 English Speakers for the Verb DISCOVER

	GROUP				
	L2 Speakers		L1 Speakers		
SENSE & SF	N	%	N	%	[a]p
DOS-DO	73	73,7	30	75,0	0,878
SCS-SC	23	23,2	10	25,0	0,825
SCS-DO	1	1,0	0	,0	0,524
SCS-OTHER	1	1,0	0	,0	0,524
NA	1	1,0	0	,0	0,524

[a]*Pearson Chi-Square*

APPENDIX-18. (Continued) Verb Sense and SF Preferences of L1 and L2 English Speakers for Each Individual Target Verb in the Absence of Promoting Contexts

As to the general tendency in the selection of DO arguments combined with the DO-biased sense, L2 speakers used words related to places in nearly 60% of their completions (e.g. *America, continent, island, place, area, land, planet*, and so on). In 13% of them, the things discovered seem to be associated with biology or chemistry (e.g. *species, bacteria, fossils, elements*). Also, phrases such as *the meaning of life, the world in himself* and *the real joy of life* were used in 13% of the completions. On the other hand, 38% of L1 speakers' DOs in these continuations were associated with material possessions such as *gold, money, treasure* and *oil well*, whereas almost 54% were about scientific inventions as in L1 speakers' completions.

Verb Sense & SF Preferences of L1 and L2 English Speakers for the Verb *ESTABLISH*

The comparison of L1 and L2 English speakers' verb sense & SF preferences for the verb *establish* pointed to statistically significant differences in their preferences of DOS-DO, SCS-SC, SCS-DO and DIF-S categories. Even though DOS-DO constructions were the most frequently preferred ones by L2 speakers, the proportions of L1 speakers' use of DOS-DO constructions and the ones that fell into the DIFF-Sense category were found to be the same. Furthermore, L2 speakers were inclined to use DOS-DO constructions more frequently than L1 speakers (p=0,005), while L1 speakers seem to favor SCS-SC constructions more (p=0,038). Lastly, statistically significant differences in the use of SCS-DO constructions (p=0,001) and different senses of the verb (p=0,003) were found between the two groups, with L1 speakers displaying stronger tendencies to use them. Nevertheless, the difference in their use of SCS-Other constructions did not reach significance level.

As for the dominant senses and structures of *establish* in these two participant groups, their sense preferences differed from each other. To be more precise, DO-sense turned out to be the dominant one in the data obtained from L2 speakers (65% DO-Sense). However, no dominant sense was identified in L1 speaker data.

APPENDIX-18. (Continued) Verb Sense and SF Preferences of L1 and L2 English Speakers for Each Individual Target Verb in the Absence of Promoting Contexts

When the sense of the verb *establish* was disregarded, participants' SF preferences, by and large, were found to overlap. Both groups predominantly opted for DO arguments and L1 speakers used them more often (*L2 Speakers:* 81,8%, *L1 Speakers:* 90%).

Verb Sense & SF Preferences of L1and L2 English Speakers for the Verb ESTABLISH

	GROUP				
	L2 SPEAKERS		L1 SPEAKERS		
SENSE & SF	**N**	**%**	**N**	**%**	**ᵃp**
DOS-DO	65	65,7	16	40,0	0,005**
SCS-SC	1	1,0	3	7,5	0,038*
SCS-DO	0	,0	4	10,0	0,001**
SCS-OTHER	0	,0	1	2,5	0,114
DIF-S	16	16,2	16	40,0	0,003**
NA	5	5,1	0	,0	0,148
INCORRECT	12	12,1	0	,0	0,021

[a]*Pearson Chi-Square* ***p<0,01* **p<0,05*

When the verb sense & SF categories were examined more closely, it was found that, in almost 77% of the sentences that fell into the DOS-DO category, L2 speakers used words like *business, company, factory, institution, foundation, charity, government* and *republic*. Likewise, the percentage of such words (e.g. *business, charity, religion, dominance, reign, kingdom*) was 68% in L1 speaker data. As to the SCS-DO constructions of L1 speakers, all of them contained *his alibi* and *residency*. Another category preferred frequently was found to be DIF-Sense. In this category, 56% of L2 speakers and 20% of L1 speakers tended to use a different sense of the verb. In these sentences which included words such as *relationship, rapport, connection, link, bond and bridge*, the verb *establish* meant "to begin a relationship with someone or a situation that will continue". Another sense (i.e. to decide something) was used in 43% of L2 and 53% of L1 speakers' completions and the verb was followed by *rules, meeting, timeline, goal, expectations* and *routine* in these sentences.

Furthermore, in 26% of L1 speaker continuations within this category, *establish* meant "to make people accept that you can do something, or that you have a particular quality". As a result, sentences like *"He established himself"* and *"He established himself as a leader"* were observed. Finally, in 80% of the incorrect uses of this verb by L2 speakers, *book* and *paper* were found to be the most frequent two words. This might have been because the participants mistook *establish* for *publish*.

Verb Sense & SF Preferences of L1 and L2 English Speakers for the Verb *FEEL*

The findings showed that DIF-S was the most frequently selected category by both L1 and L2 speakers following the verb *feel*. Even though high numbers of sentence continuations including these constructions were produced by both participant groups, no statistically significant differences were found between them. Furthermore, SCS-SC and DOS-DO were the two SFs categories that followed DIF-S in terms of frequency. However, two groups displayed no considerable differences in the use of these constructions as presented in the table below.

Verb Sense & SF Preferences of L1 and L2 English Speakers for the Verb FEEL

	GROUP				
	L2 SPEAKERS		**L1 SPEAKERS**		
SENSE & SF	**N**	**%**	**N**	**%**	**^{a}p**
DOS-DO	3	3,0	1	2,5	0,866
SCS-SC	6	6,1	2	5,0	0,808
DIF-S	89	89,9	37	92,5	0,634
INCORRECT	1	1,0	0	,0	0,524

APPENDIX-18. (Continued) Verb Sense and SF Preferences of L1 and L2 English Speakers for Each Individual Target Verb in the Absence of Promoting Contexts

As to the dominant sense of *feel*, neither of the senses targeted in the present study turned out to be the dominant one as the majority of the participants used a different sense of it in their sentence continuations. Nevertheless, when the overall bias for *feel* was examined regardless of the verb senses, it was observed that SC arguments were used more commonly compared to DO arguments by both groups (*L2 Speakers:* 6,1% SC; *L1 Speakers:* 5% SC).

A closer look at the participants' continuations revealed that L2 speakers' DOS-DO constructions in which the verb *feel* refers to a perception by a physical sensation included phrases like *the wind, his father's comforting hand* and *my skin*.

In 80% of L2 speaker and 81% of L1 speaker completions in the DIF-S category, *feel* was used as a linking verb and thus was followed by an adjective. In addition, the preposition *like* was used following the verb *feel* in almost 9% of the L2 speaker and 8% of the L1 speaker completions. In 25% of these continuations produced by L2 speakers, a noun followed the prepositions (e.g. *He felt like an outsider*), while 75% of them included an SC following *like* (e.g. *He felt like he was dying after he heard the news*). As to the continuations of L1 speakers, 33% included a noun (e.g. *He felt like a child*), 33% an SC (e.g. *He felt like he was getting sick*) and 33% a gerund (e.g. *He felt like killing himself after the bad reviews*). Another common preference of the participants was that they used a noun following the verb *feel* carrying the sense "to experience a particular feeling or emotion". In approximately 9% of L2 speaker and 8% of L1 speaker continuations categorized as DIF-S, *feel* was followed by nouns referring to feelings and emotions such as *sorrow, strong hatred, joy, sudden panic* and *a rush*.

Verb Sense & SF Preferences of L1 and L2 English Speakers for the Verb *FIND*

As a result of a comparison of the L1 and L2 English speakers' sense & SF preferences for the verb *find*, statistically significant differences in their preferences of DOS-DO and DIF-S categories were detected. Although DOS-DO constructions were the most frequently preferred ones in both groups, L1 speakers used them more often compared to L2 speakers ($p=0,003$; $p<0,01$). Moreover, different senses of *find* were favored more by L2 speakers (p=0,001; p<0,01). However, the differences in these two participant groups' use of SCS-SC, SCS-DO and AMB-S did not reach the significance level.

Verb Sense & SF Preferences of L1 and L2 English Speakers for the Verb FIND

	GROUP				
	L2 SPEAKERS		L1 SPEAKERS		
SENSE & SF	N	%	N	%	[a]p
DOS-DO	64	64,6	36	90,0	0,003**
SCS-SC	7	7,1	2	5,0	0,653
SCS-DO	0	,0	1	2,5	0,114
DIF-S	26	26,3	1	2,5	0,001**
AMB-S	2	2,0	0	,0	0,365

[a]*Pearson Chi-Square* **p<0, 01*

In both groups of participants, DO-biased sense was the dominant one (*L2 Speakers:* 64%; *L1 Speakers:* 90%) and when the sense of the verb *find* was disregarded, both L1 and L2 speakers were inclined to use DO arguments frequently. This means that *find* could be categorized as a DO-biased verb in this study (*L2 Speakers:* 75%, *L1 Speakers:* 93%). The percentages also indicated that the tendency of L1 speakers towards using its DO-biased sense and DO arguments following it was stronger compared to L2 speakers.

When the DIF-S category was examined more closely, it was found that, in 62% of the sentences in this category, L2 speakers added the particle *out* and used the phrasal verb *find out*, which means "to find information, after trying to discover it or by chance". The most frequently preferred constructions following this phrasal verb were SCs (69%), NPs (19%) and *Wh*-S continuations (13%), respectively. Also, in about 31%of the continuations in this category, L2 speakers used another sense (i.e. to think or feel a particular way about someone/something), which requires the use of an adjective following a noun phrase (e.g. *"He found this work boring"* and *"He found the room* *fascinating"*). There were also a few examples (8%) in which *find* meant "to realize that you are in a particular place or situation when you did not intend to" (e.g. *He found himself in a bad situation*). On the other hand, only a couple of L1 English speakers tended to use the phrasal verb *find out*, while they did not opt for the other senses favored by L2 speakers.

As to the most frequently used NPs that DOS-DO constructions consisted of, two groups of participants displayed a regular pattern as they alike preferred to use a variety of words to refer to money (e.g. *dollar, cent, quarter, bill, nickel, penny*) and valuable things (e.g. *treasure, watch, necklace, ring, wallet, phone*) in most of their sentence continuations.

Verb Sense & SF Preferences of L1 and L2 English Speakers for the Verb *GRASP*

As the test statistics in the table below indicate, L1 and L2 speakers of English had a lot in common in terms of their verb sense & SF choices following the verb *grasp*. In both groups, the most frequently preferred category was DOS-DO, and SCS-DO constructions ranked second. Also, while both participant groups displayed no statistically significant differences in their preferences in 8 out of 9 categories, the only category in the use of which L1 and L2 speakers diverged considerably was DIF-S. To put a finer point on it, L1 English speakers were found to have a stronger inclination to use different senses of this particular verb than L2 speakers (p=0,005). Moreover, notwithstanding the scarcity of SCS-SC and SCS-Other constructions, it is worth noting that they were selected by only L2 speakers.

APPENDIX-18. (Continued) Verb Sense and SF Preferences of L1 and L2 English Speakers for Each Individual Target Verb in the Absence of Promoting Contexts

Verb Sense & SF Preferences of L1 and L2 English Speakers for the Verb GRASP

	GROUP				
	L2 SPEAKERS		**L1 SPEAKERS**		
SENSE & SF	**N**	**%**	**N**	**%**	**[a]p**
DOS-DO	56	56,6	23	57,5	0,920
SCS-SC	1	1,0	0	,0	0,524
SCS-DO	22	22,2	7	17,5	0,535
DOS-OTHER	2	2,0	1	2,5	0,860
SCS-OTHER	2	2,0	0	,0	0,365
DIF-S	6	6,1	9	22,5	0,005**
NA	8	8,1	0	,0	0,064
AMB-S	1	1,0	0	,0	0,524
INCORRECT	1	1,0	0	,0	0,524

[a]*Pearson Chi-Square* ***p<0,01*

Dominant sense and overall bias information also provided clear evidence for the compatibility between the participant groups pertaining to their preferences. DO-sense of the verb was the dominant one among L1 speakers, while neither of the senses turned out to be dominant over the other one in L2 speaker data. On the other hand, both L1 and L2 speakers tended to use DO arguments following this verb (*L2 Speakers:* 79%; *L1 Speakers:* 75%).

A deeper look into the continuations in the DOS-DO category indicated that 34% of L2 speaker and 9% of L1 speaker completions included vocabulary related to body parts such as *hand, arm, shoulder, wrist* and *neck*. Additionally, 14% of L2 speakers' and 43% of L1 speakers' DOS-DO constructions included objects such as *bag, wallet, purse, railing* and *branch*. Unlike L1 speakers, L2 speakers showed a tendency towards using nouns or pronouns referring to people (e.g. *her, me, the girl, the child*) in 7% of their DOS-DO constructions. In these continuations, adverbs of manner such as *tightly, suddenly*, and *harshly* could be observed in the datasets obtained from both groups of participants (*L2 Speakers*: 9%; *L1 Speakers:* 9%). Furthermore, the small number of DOS-Other constructions included no DOs and they were complemented with adverbs of manner, instead (e.g. *"He grasped heavily"* and *"He grasped desperately"*). As to SCS-DO constructions, nearly 82% of L2 speaker and 30% of L1 speaker continuations included abstract vocabulary items such as *ideas, meaning, truth, concept* and *problem*. In the remaining part, words like *subject, lesson, topic, situation, task* and *news* were included. The L2 speaker continuations categorized as SCS-Other constructions either included *Wh*-clauses (e.g. *He grasped what he wants to say*) or another verb linked with *and* (e.g. *He grasped and shook his head negatively*). Lastly, four different senses of the verb *grasp* were used by both L1 and L2 speakers. In 67% of L2 speaker and 33% of L1 speaker continuations within the DIF-Sense category, *grasp* meant "to try to touch or hold on to something" and it was followed by the preposition "at" (e.g. *"He grasped at my right sleeve",* and *"He grasped at the branch"*). Also, "to eagerly and quickly use an opportunity to do something" was the sense used in 33% of L2 speaker continuations and thus they produced sentences such as *"He grasped the opportunity to enter the academy"* and *"He grasped a chance to marry"*. The third sense used only by L1 English speakers led to an idiomatic use of the verb (*to grasp at straws*) and meant "try to find some way to succeed when nothing you choose is likely to work". As a result, sentences such as *"He grasped at straws"* and *"He grasped at thin straws"* were observed in 44% of the sentences in this dataset. Finally, in 22% of the L1 speaker continuations in this category, the sense of *grasp* was "to try in a desperate and awkward way to get something". As a result, sentences such as *"He grasped for air"* and *"He grasped for life"* were observed.

Verb Sense & SF Preferences of L1 and L2 English Speakers for the Verb *INDICATE*

The findings showed that SCS-SC, SCS-DO and DOS-DO were the three SF categories selected most frequently by both L1 and L2 speakers of English following the verb *indicate*, and no considerable differences between the two participant groups in terms of the use of these constructions were found. The only category in which L1 and L2 speakers displayed a substantial difference was the DIF-S. That is, L1 speakers of English were inclined to use a different sense of *indicate* more often (p=0,025).

APPENDIX-18. (Continued) Verb Sense and SF Preferences of L1 and L2 English Speakers for Each Individual Target Verb in the Absence of Promoting Contexts

As to the dominant sense of *indicate*, both groups seemed to use the SC-biased sense of it mostly and this sense was more dominant among L1 speakers (*L2 Speakers:* 71% vs. *L1 Speakers:* 83%). This tendency was no different when the overall bias for *indicate* was examined. Both participant groups preferred SC arguments in more than half of their continuations, with L1 speakers using them a little more frequently (*L2 Speakers:* 56% vs. *L1 Speakers:* 65%).

Verb Sense & SF Preferences of L1 and L2 English Speakers for the Verb INDICATE

	GROUP				
	L2 SPEAKERS		**L1 SPEAKERS**		
SENSE & SF	**N**	**%**	**N**	**%**	**[a]p**
DOS-DO	11	11,1	4	10,0	0,848
SCS-SC	53	53,5	26	65,0	0,217
SCS-DO	15	15,2	5	12,5	0,687
DOS-OTHER	0	,0	1	2,5	0,114
SCS-OTHER	2	2,0	2	5,0	0,341
DIF-S	0	,0	2	5,0	0,025*
INCORRECT	3	3,0	0	,0	0,266
AMB-S	8	8,1	0	,0	0,064
NA	7	7,1	0	,0	0,084

[a]Pearson Chi-Square ***p<0,01*

In the SCS-DO category, 53% of the sentences completed by L2 speakers involved words like *resolution, truth, rules, disapproval, opinions, fact* and *topic*. Similarly, *indicate* was followed by *truth, intent, approval* and *fault* in the 80% of the sentence continuations produced by L1 English speakers. In addition, 5% of L1 speakers in this study chose a different sense of *indicate* which denotes people's "intention to turn left or right when they are driving".

Lastly, 75% of the incorrect continuations provided by L2 speakers resulted from the incorrect uses of prepositions. In this category, sentences such as *"He indicated me that he is very shy"* and *"He indicated on his opinion"* were observed.

APPENDIX-18. (Continued) Verb Sense and SF Preferences of L1 and L2 English Speakers for Each Individual Target Verb in the Absence of Promoting Contexts

Verb Sense & SF Preferences of L1 and L2 English Speakers for the Verb *OBSERVE*

A comparison of L1 and L2 English speakers' selections following *observe* showed that these two groups did not differ significantly in the constructions they used. Regardless of the participants' native languages, the most frequently used constructions following *observe* were DOS-DO, SCS-SC and DOS-Other, respectively. Also, no other constructions falling into other categories were used. It is also noteworthy that L1 speakers tended to use DOS-DO constructions more often than L2 speakers did, whereas the reverse was true for SCS-SC constructions.

Verb Sense & SF Preferences of L1 and L2 English Speakers for the Verb OBSERVE

	GROUP				
	L2 SPEAKERS		L1 SPEAKERS		
SENSE & SF	**N**	**%**	**N**	**%**	**[a]p**
DOS-DO	82	82,8	37	92,5	0,141
SCS-SC	13	13,1	1	2,5	0,059
DOS-OTHER	3	3,0	2	5,0	0,572
INCORRECT	1	1,0	0	,0	0,524

[a]*Pearson Chi-Square*

The findings about the dominant sense and the overall bias of *observe* showed a strong tendency towards the use of the DO-sense of this verb. That is to say, 86% of L2 speakers and 98% of L1 speakers of English used the DO-sense of *observe*. Likewise, DO arguments were included in the sentence continuations of 83% of L2 speakers and 93% of L1 speakers.

A more detailed analysis of DOS-DO continuations indicated that 32% of L2 speaker and 57% of L1 English speaker productions included vocabulary related to astronomy (e.g. *stars, sky, moon, eclipse, planets, galaxy*) or nature (e.g. *birds, animals, species*). The second most frequently used DO arguments referred to people

(*L2 Speakers:* 11%; *L1 Speakers:* 27%) and included words such as *people, kids, children, protestors* and *shoppers.* Pronouns were used in almost 5% of both L1 and L2 speakers' completions. In addition, L2 speakers used words related to education in 21% of their continuations (e.g. *class, students, lesson, presentation*). Sentence continuations categorized as DOS-Other showed both groups of participants sometimes used adverbs just after *observe* and produced sentences such as *"He observed quietly/carefully"* and *"He observed from afar"*. Finally, two out of three DOS-Other constructions used by L2 speakers contained *Wh*-phrases as in *"He observed what was happening"*.

Verb Sense & SF Preferences of L1 and L2 English Speakers for the Verb *RECALL*

As the Chi-square results provided in the table below show, the most frequently preferred category for *recall* was SCS-DO in both groups, with L1 speakers using them significantly more often (p = 0.013). SCS-Other seems to be the second most frequent one in L1 speaker data, whereas L2 speakers preferred SCS-SC constructions. As can be inferred from these categories, SC-sense of *recall* was dominant in both groups, though L1 speakers used this particular sense in an overwhelming majority of their sentences (*L2 speakers:* 73%; *L1 Speakers:* 93%). This tendency was reversed when it came to their structural preferences. That is, DO arguments predominated in the continuations of both groups (*L2 Speakers:* 55% ; *L1 Speakers:* 75%).

A detailed examination of these categories demonstrated that sentence completions of L1 and L2 speakers within the SCS-DO category shared similarities. For instance, in 43% of L2 speaker and 31% of L1 speaker continuations in this category included the word *memory*. Some other common nouns used by both groups were *childhood, name, voice, event* and *experience*. L2 speakers also bore resemblance to L1 speakers in that their SCS-Other constructions contained either gerunds

APPENDIX-18. (Continued) Verb Sense and SF Preferences of L1 and L2 English Speakers for Each Individual Target Verb in the Absence of Promoting Contexts

Verb Sense & SF Preferences of L1 and L2 English Speakers for the Verb RECALL

	GROUP				
	L2 Speakers		**L1 Speakers**		
SENSE & SF	**N**	**%**	**N**	**%**	**ap**
DOS-DO	5	5,1	1	2,5	0,503
SCS-SC	12	12,1	1	2,5	0,078
SCS-DO	49	49,5	29	72,5	0,013*
SCS-OTHER	11	11,1	7	17,5	0,310
NA	4	4,0	0	,0	0,197
AMB-S	14	14,1	2	5,0	0,126
INCORRECT	4	4,0	0	,0	0,197

aPearson Chi-Square **p<0,05*

(e.g. *He recalled bringing his bag*) or *Wh*-complements (e.g. *He recalled where he left his book*). As for the erroneous completions of L2 speakers, it seems they attempted to mean "to call someone again" by using the verb *recall*, which resulted in incorrect sentences (e.g. *He recalled the police to say that his brother was guilty*). Likewise, all sentence continuations that in the Amb_S category included sentences like *"He recalled his mother five times"* and *"He recalled his ex-girlfriend"*. It is hard to distinguish whether it means "to remember something from the past" or the participants made generalizations based on the assumption that the prefix -re means *again*. That is why these continuations fell under the category "ambiguous sense".

Verb Sense & SF Preferences of L1 and L2 English Speakers for the Verb *RECOGNIZE*

The results provided in the table below revealed that a similar tendency towards using DOS-DO constructions as the most frequent verb sense & SF was evident in the data gathered from both L1 and L2 speakers of English. However, the categories which ranked second in these two groups were found to be different.

APPENDIX-18. (Continued) Verb Sense and SF Preferences of L1 and L2 English Speakers for Each Individual Target Verb in the Absence of Promoting Contexts

L1 speakers opted for SCS-DO constructions more frequently than L2 speakers did but the difference between these two groups was not statistically significant (*L2 Speakers:* 6%; *L1 Speakers:* 13%, p=0,203). As for the second most frequently selected category by L2 speakers, they used considerably more SCS-SC constructions compared to L1 speakers, which led to a statistically significant difference between these two groups (p=0,045). Finally, SCS-Other and DIF-S were the other two categories preferred and the participant groups did not differ significantly in their use. Also, L1 and L2 speakers produced sentences falling into NA, AMB-S and INCORRECT categories but their numbers are quite small in percentage terms.

Verb Sense & SF Preferences of L1and L2 English Speakers for the Verb RECOGNIZE

	GROUP				
	L2 SPEAKERS		**L1 SPEAKERS**		
SENSE & SF	**N**	**%**	**N**	**%**	**[a]p**
DOS-DO	63	63,6	27	67,5	0,666
SCS-SC	25	25,3	4	10,0	0,045*
SCS-DO	6	6,1	5	12,5	0,203
SCS-OTHER	0	,0	1	2,5	0,114
DIF-S	2	2,0	2	5	0,341
NA	1	1,0	0	,0	0,524
AMB-S	0	,0	1	2,5	0,114
INCORRECT	2	2,0	0	,0	0,365

[a]*Pearson Chi-Square* **p<0,05*

The close similarities in participants' sense & SF preferences were also reflected in their inclinations towards the dominant sense and the overall verb bias of *recognize*. In both datasets, DO-sense was the dominant sense of *recognize* and a comparison of these two groups' choices indicated that the percentages were quite close to one another (*L2 Speakers:* 64%; *L1 Speakers:* 68%). In parallel with their selection of verb sense, both groups used DO arguments a lot more frequently compared to SC arguments, with a stronger bias in L1 speaker data (*L2 Speakers:* 72%; *L1 Speakers:* 85%).

APPENDIX-18. (Continued) Verb Sense and SF Preferences of L1 and L2 English Speakers for Each Individual Target Verb in the Absence of Promoting Contexts

A closer examination of DOS-DO constructions revealed that almost 88% of L2 and 67% of L1 English speaker participants' sentence completions included either personal pronouns (e.g. *him, her, me*) or nouns referring to people (e.g. *friend, man, person, guy, lady, celebrity, neighbor,* and *enemy*). Furthermore, in 9% of L2 speaker continuations, participants used *at one glance, at first glance* and *at first sight*. Lastly, 37% of L2 and 11% of L1 speaker continuations in the category of DOS-DO included adverbials of time or conjunctions of time such as *immediately, right away, in an instant, the moment, as soon as* and when. As to the completions categorized as SCS-DO, noun phrases such as *his value, the difference, the hints, his mistake,* and *his potential* followed the verb *recognize*. In addition, two different senses of *recognize* were used by both groups, albeit in small numbers. In their sentences such as "*He recognized his ideas"* and "*He recognized the art"*, they seem to have meant "to realize that something is very good or important". Likewise, in their sentences *"He recognized his authority"* and *"He recognized his authority as a policeman"*, the verb meant "to officially accept that an organization, etc. has official authority".

Verb Sense & SF Preferences of L1 and L2 English Speakers for the Verb *REFLECT*

As the counts and percentages presented in the table below indicate, L1 and L2 English speakers showed different tendencies in terms of their preferences for verb senses & SFs following *reflect*. To begin with, L2 speakers preferred using a different sense of the verb *reflect* most frequently, whereas L1 speakers mostly used SCS-Other constructions. Apart from these most-commonly preferred categories, L2 speakers' continuations included SCS-Other, DOS-DO and SCS-SC constructions. On the other hand, L1 speakers' frequently used categories were SCS-Other, DOS-DO and DOS-Other. Although two groups of participants' choices varied across SF categories, statistically significant differences between L1 and L2 speakers were observed in only two categories. First of all, L2 speakers used a different sense of *reflect* in almost 40% of their completions, whereas it was not included in L1 speakers' at all (p=0,001).

APPENDIX-18. (Continued) Verb Sense and SF Preferences of L1 and L2 English Speakers for Each Individual Target Verb in the Absence of Promoting Contexts

Moreover, L1 speakers preferred SCS-Other constructions in almost all of their continuations (93%); however, the percentage of these constructions in L2 speaker data was only 18% (p=0,001).

As to the dominant sense of *reflect*, L1 English speakers used its SC-sense in almost 93% of their completions, whereas no dominant sense was detected in L2 speakers' continuations. Despite this difference, two groups of participants bore some similarity in their choices of argument structures. In both sets of data, *reflect* was a DO-biased verb though they were included far more frequently in L2 speakers' completions.

Verb Sense & SF Preferences of L1 and L2 English Speakers for the Verb REFLECT

	GROUP				
	L2 SPEAKERS		**L1 SPEAKERS**		
SENSE & SF	**N**	**%**	**N**	**%**	**[a]p**
DOS-DO	13	13,1	2	5,0	0,162
SCS-SC	5	5,1	0	,0	0,148
DOS-OTHER	0	,0	1	2,5	0,114
SCS-OTHER	18	18,2	37	92,5	0,001**
DIF-S	39	39,4	0	,0	0,001**
NA	9	9,1	0	,0	0,049*
AMB-S	1	1,0	0	,0	0,524
INCORRECT	14	14,1	0	,0	0,012*

[a]*Pearson Chi-Square* ***p<0,01*

APPENDIX-18. (Continued) Verb Sense and SF Preferences of L1 and L2 English Speakers for Each Individual Target Verb in the Absence of Promoting Contexts

When the DOS-DO constructions used by L1 and L2 speakers were examined, it was found that words like *light, sunlight* and *ray* were used in 57% of them. Moreover, one of the categories that included a substantial number of L1 and L2 speaker completions was SCS-Other. The data collected from both participant groups included prepositional phrases, adverbs and *Wh*-complements following *reflect*. A closer look at L2 speaker completions indicated that 55% of them in this category included the preposition *on* just after the main verb (i.e. *He reflected on his teenage memories*). Similarly, the sentence *"He reflected back on the past"* also seemed to fit into the same category. Almost 28% of the L2 speakers produced sentences including *Wh*- complements such as *"He reflected what she did to him"*. In the remaining 11% of the continuations, participants only used adverbs such as *well* and *negatively* following the verb. In parallel with L2 speakers' preferences, L1 speakers also chose to use prepositional phrases, the head of which was *on* in 86% of their continuations. What is more, 5% of their sentences included the preposition *on* followed by a *Wh*- complement. As a result, sentences like *"He reflected on why he had lost"* were produced. *Wh*- complements were also preferred in another 5% of the sentences, but without the preposition (e.g. *He reflected what he had seen*). Furthermore, some L1 speakers completed the sentence fragments with only adverbs such as *thoughtfully* and *solemnly*.

Verb Sense & SF Preferences of L1 and L2 English Speakers for the Verb REPORT

As the Chi-Square results in the table below show, L1 and L2 English speakers differed from each other with respect to the constructions they preferred most frequently following the verb *report*. To be more precise, DOS-DO constructions were favored more by L1 speakers (p=0,014) compared to L2 speakers, who mostly opted to produce SCS-SCs (p=0,007). Though the frequencies and percentages also indicate differences in the other seven categories, none of them turned out to be statistically significant.

APPENDIX-18. (Continued) Verb Sense and SF Preferences of L1 and L2 English Speakers for Each Individual Target Verb in the Absence of Promoting Contexts

Verb Sense & SF Preferences of L1 and L2 English Speakers for the Verb REPORT

	GROUP				
	L2 SPEAKERS		L1 SPEAKERS		
SENSE & SF	**N**	**%**	**N**	**%**	**[a]p**
DOS-DO	30	30,3	21	52,5	0,014*
SCS-SC	32	32,3	4	10,0	0,007**
SCS-DO	19	19,2	9	22,5	0,660
DOS-SC	9	9,1	1	2,5	0,173
DOS-OTHER	1	1,0	1	2,5	0,504
SCS-OTHER	3	3,0	3	7,5	0,240
INCORRECT	3	3,0	0	,0	0,266
DIF-S	1	1,0	1	2,5	0,504
NA	1	1,0	0	,0	0,524

[a]Pearson Chi-Square ***p<0,01*

The examination of the dominant sense and the overall bias of *report* demonstrated that in neither group, one particular sense of this target verb dominated the other one. Apart from this similarity, L1 and L2 speakers differed in their structural preferences. Sentence completions of L2 speakers showed that *report* was an equi-biased verb (50% DO arguments, 41% SC arguments), while L1 speakers mostly opted for DO arguments (75%)

A category-specific examination of the continuations revealed that L1 and L2 speakers had overlapping preferences in DOS-DO constructions. More than 50% of all these continuations in both groups included crime vocabulary like *crime, incident, event, break-in, accident, gunshot, fight, casualties* and *trespassing*. In the majority of the remaining continuations, participants used words referring to people and again related to crime such as *thieves, criminal, murderer, killer, drunk driver, noisy neighbor* and *intruder* (47% in L2 speaker data and 29% in L1 speaker data). Moreover, 19% of L1 speakers produced sentences such as *"He reported his taxes"* and *"He reported his income"*.

Half of L2 speaker continuations categorized as SCS-DO included idiomatic/colloquial expressions such as *"He reported the news"* and *"He reported the* *weather forecast"*. The percentage of similar uses among L1 English speakers was approximately 67%. In addition, sentences such as *"He reported for duty"* and *"He reported to his boss"* were assigned to the DIFF-S category in which neither the SC-biased nor the DO-biased sense of the target verb was used. Finally, in 67% of the incorrect continuations of L2 speakers, there were problems with the use of prepositions (e.g. *"He reported the embassy that he wanted to stay longer"* or *"He reported to the exam results"*).

Verb Sense & SF Preferences of L1 and L2 English Speakers for the Verb *REVEAL*

As a result of the comparison of L1 and L2 English speakers' preferences following the verb *reveal*, it was found that these two groups bore striking similarities and no statistically significant differences in the use of seven types of constructions were observed. The category preferred most frequently by both groups was SCS-DO, and SCS-SC constructions ranked second in frequency. DOS-DO and SCS-Other constructions followed them in the data gathered from both groups, respectively. Moreover, in spite of the negligible percentages, both L1 and L2 speakers produced sentence continuations in which it was hard to judge the intended meaning of *reveal*.

The parallelism in two groups' preferences could be observed in the dominant sense and the overall bias of *reveal*, as well. In both datasets, SC-sense seemed to be the dominant sense and the percentages indicated that it was almost equally strong in both groups (*L2 Speakers:* 92%; *L1 Speakers:* 90%). When it comes to their structural preferences, they followed a set pattern as more than half of the sentence continuations produced by both L1 and L2 speakers included DO arguments. The difference in DO argument use by these two groups was, in percentage terms, quite small (*L2 Speakers:* 66%; *L1 Speakers:* 68%).

APPENDIX-18. (Continued) Verb Sense and SF Preferences of L1 and L2 English Speakers for Each Individual Target Verb in the Absence of Promoting Contexts

Verb Sense & SF Preferences of L1 and L2 English Speakers for the Verb REVEAL

	GROUP				
	L2 SPEAKERS		L1 SPEAKERS		
SENSE & SF	**N**	**%**	**N**	**%**	**[a]p**
DOS-DO	2	2,0	2	5	0,341
SCS-SC	27	27,3	10	25,0	0,784
SCS-DO	63	63,6	25	62,5	0,900
SCS-OTHER	1	1,0	1	2,5	0,504
NA	2	2,0	0	,0	0,365
AMB-S	2	2,0	2	5,0	0,341
INCORRECT	2	2,0	0	,0	0,365

[a]*Pearson Chi-Square*

An in-depth analysis of the SCS-SC constructions of L2 speakers revealed that 37% of these sentences included crime vocabulary (e.g. *murder, murderer, crime, criminal, thief, stolen, ripper, steal,* and so on). With regard to the use of SCS-DO constructions, 84% of all these continuations produced by L2 speakers included nouns such as *truth, secret, fact, mystery, identity* and *plan*. Likewise, the percentage of these continuations including nouns such as *truth, secret, persona, sexuality* and *plan* comprised 80% of L1 speakers' SCS-DO constructions. Furthermore, both participant groups' SCS-Other constructions included *Wh*-complements. For instance, *"He revealed what was going on"* and *"He revealed why he was crying"* were two sentences that fell into this category. As to the completions categorized as Amb-Sense, both groups tended to use pronouns such as *it, something, nothing* or adverbs such as *suddenly*, which made it difficult to judge which sense was intended by the participants. Finally, the incorrect uses of L2 speakers seem to have resulted from confusing the verb *reveal* with some other verbs that have phonological similarities with it. To illustrate, in the sentence *"He revealed her pain"*, the participant could have mistaken it for the verb *relieved*. Similarly, in the sentence *"He revealed calm"*, *reveal* appears to have been confused with *remain*.

APPENDIX-19. The Results of Tests Performed Using the Sense-Related Data Following SC-Biased Verb Senses

Results of K-Way and Higher-Order Effects (for the use of SC-Biased Senses of Verbs)

			Likelihood Ratio		Pearson	
	K	***Df***	***Chi-Square***	***Sig.***	***Chi-Square***	***Sig.***
K-way and Higher Order Effects	1	7	1923,768	,000	1623,063	,000
	2	4	1072,561	,000	1032,672	,000
	3	1	84,004	,000	76,851	,000
K-way Effects	1	3	851,207	,000	590,390	,000
	2	3	988,558	,000	955,822	,000
	3	1	84,004	,000	76,851	,000

* all main effects, two and three-way interactions needed to be retained

Backward Elimination Statistics (for the use of SC-Biased Senses of Verbs)

Step[a]		**Effects**	**Chi-Square**[c]	**Df**	**Sig**
0	***Generating Class***[b]	Group * Experiment * Use of SC-biased sense	,000	0	.
	Deleted Effect	Group * Experiment * Use of SC-biased sense	84,004	1	,000
1	***Generating Class***[b]	Group * Experiment * Use of SC-biased sense	,000	0	.

a. At each step, the effect with the largest significance level for the Likelihood Ratio Change is deleted, provided the significance level is larger than ,050.
b. Statistics are displayed for the best model at each step after step 0.
c. For 'Deleted Effect', this is the change in the Chi-Square after the effect is deleted from the model.
* the highest-order interaction contributed significantly to the model's fit and thus should be retained

Results of Goodness-of-Fit Tests (for the use of SC-Biased Senses of Verbs)

	Chi-Square	**Df**	**Sig.**
Likelihood Ratio	,000	0	.
Pearson	,000	0	.

* the fully saturated model was the perfect fit for the data.

APPENDIX-20. The Results of Tests Performed Using the SF-Preference Data Following SC-Biased Verb Senses

Results of K-Way and Higher-Order Effects (for SF preferences following the SC-Biased Senses of Verbs)

			Likelihood Ratio		**Pearson**	
	K	***Df***	***Chi-Square***	***Sig.***	***Chi-Square***	***Sig.***
K-way and Higher Order Effects	1	11	1710,364	,000	1854,232	,000
	2	7	232,250	,000	212,149	,000
	3	2	14,179	,001	14,394	,001
K-way Effects	1	4	1478,114	,000	1642,083	,000
	2	5	218,071	,000	197,755	,000
	3	2	14,179	,001	14,394	,001

* not only the main effects but also all interactions had significant roles in the fit of the model

Backward Elimination Statistics (for the SF preferences following SC-Biased Senses of Verbs)

Step[a]		**Effects**	**Chi-Square[c]**	**Df**	**Sig**
0	***Generating Class[b]***	Group * Experiment * SF Preferences	,000	0	.
	Deleted Effect	Group * Experiment * SF Preferences	14,179	2	,001
1	***Generating Class[b]***	Group * Experiment * SF Preferences	,000	0	.

a. At each step, the effect with the largest significance level for the Likelihood Ratio Change is deleted, provided the significance level is larger than ,050.
b. Statistics are displayed for the best model at each step after step 0.
c. For 'Deleted Effect', this is the change in the Chi-Square after the effect is deleted from the model.
*backward elimination statistics indicated the clear need for retaining the three-way interaction in the model

Results of Goodness-of-Fit Tests (for the use of SC-Biased Senses of Verbs)

	Chi-Square	**Df**	**Sig.**
Likelihood Ratio	,000	0	.
Pearson	,000	0	.

* a perfect match between the fully saturated model applied and the data analyzed was found

APPENDIX-21. The Results of Tests Performed Using the Sense-Related Data Following DO-Biased Verb Senses

Results of K-Way and Higher-Order Effects (for the use of DO-Biased Senses of Verbs)

			Likelihood Ratio		Pearson	
	K	***Df***	***Chi-Square***	***Sig.***	***Chi-Square***	***Sig.***
K-way and Higher Order Effects	1	7	1228,516	,000	1298,009	,000
	2	4	587,141	,000	634,171	,000
	3	1	11,895	,001	11,781	,001
K-way Effects	1	3	641,375	,000	663,838	,000
	2	3	575,246	,000	622,390	,000
	3	1	11,895	,001	11,781	,001

* none of the components in the saturated model were deleted.

Backward Elimination Statistics (for the use of DO-Biased Senses of Verbs)

Step[a]		Effects	Chi-Square[c]	Df	Sig
0	***Generating Class[b]***	Group * Experiment * Use of DO-sense	**,000**	**0**	**.**
	Deleted Effect	Group * Experiment * Use of DO-sense	**11,895**	**1**	**,001**
1	***Generating Class[b]***	Group * Experiment * Use of DO-sense	**,000**	**0**	**.**

a. At each step, the effect with the largest significance level for the Likelihood Ratio Change is deleted, provided the significance level is larger than ,050.
b. Statistics are displayed for the best model at each step after step 0.
c. For 'Deleted Effect', this is the change in the Chi-Square after the effect is deleted from the model.
* the highest-order interaction was not removed from the model not to weaken its reliability

Results of Goodness-of-Fit Tests (for the use of DO-Biased Senses of Verbs)

	Chi-Square	Df	Sig.
Likelihood Ratio	,000	0	.
Pearson	,000	0	.

* a perfect fit between the fully saturated model and the datasets was displayed

APPENDIX-22. The Results of Tests Performed Using the SF-Preference Data Following DO-Biased Verb Senses

Results of K-Way and Higher-Order Effects (for SF preferences following the DO-Biased Senses of Verbs)

			Likelihood Ratio		Pearson	
	K	*Df*	*Chi-Square*	*Sig.*	*Chi-Square*	*Sig.*
K-way and Higher Order Effects	1	11	3496,269	,000	3668,858	,000
	2	7	131,114	,000	117,293	,000
	3	2	4,641	,098	4,300	,116
K-way Effects	1	4	3365,154	,000	3551,565	,000
	2	5	126,473	,000	112,993	,000
	3	2	4,641	,098	4,300	,116

*all main effects and two-way interactions were retained, whereas the three-way interaction was deleted

Backward Elimination Statistics (for the SF preferences following DO-Biased Senses of Verbs)

Step[a]			**Effects**	**Chi-Square[c]**	**Df**	**Sig**
0	***Generating Class[b]***		Group * Experiment * SF Preferences	,000	**0**	**.**
	Deleted Effect	***1***	Group * Experiment * SF Preferences	4,641	2	,098
1	***Generating Class[b]***		Group * Experiment, Group * SF Preferences, Experiment * SF Preferences	4,641	2	,098
	Deleted Effect	***1***	Group * Experiment	60,694	1	,000
		2	Group * SF Preferences	8,759	2	,013
		3	Experiment * SF Preferences	65,833	2	,000
2	***Generating Class[b]***		Group * Experiment, Group * SF Preferences, Experiment * SF Preferences	4,641	2	,098

a. At each step, the effect with the largest significance level for the Likelihood Ratio Change is deleted, provided the significance level is larger than ,050.
b. Statistics are displayed for the best model at each step after step 0.
c. For 'Deleted Effect', this is the change in the Chi-Square after the effect is deleted from the model.
*the three-way interaction was removed.

APPENDIX-22. (Continued) The Results of Tests Performed Using the SF-Preference Data Following DO-Biased Verb Senses

Results of Goodness-of-Fit Tests (for the use of DO-Biased Senses of Verbs)

	Chi-Square	**Df**	**Sig.**
Likelihood Ratio	4,641	2	,098
Pearson	4,300	2	,116

*the model selected was highly appropriate for the analyses conducted