Non-native Speaker Attentional Capacity and the Processing of English Phrasal Verb Constructions

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NON-NATIVE SPEAKER ATTENTIONAL CAPACITY AND THE PROCESSING OF ENGLISH PHRASAL VERB CONSTRUCTIONS

by

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DEDICATION

To all of my family and friends, and especially for my son Jamie, whose arrival in the middle of this challenging process has taught me balance, patience, and perspective.
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Upon embarking on this process, several very brilliant people informed me that dissertation writing is a lonely endeavor. While this is undoubtedly true, I would like to take this moment to offer my sincere gratitude to those who prepared me in various ways to complete this dissertation, helped me throughout the formation and execution of the study, and made the entire process a little less lonely.

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ABSTRACT

The effect of syntactic and semantic complexity on attention and processing in second language acquisition (SLA) has long been of interest to both practitioners and researchers of SLA. Theoretical models of attention in SLA (Schmidt 1990, Tomlin and Villa 1994, Robinson 1995) have spurred a great deal of empirical research in the field, and VanPatten’s (1994, 2004, 2007) work on the effect of attention to form and meaning on comprehension of input has been very influential in the field. From a language processing viewpoint, Clahsen and Felser (2006, 2009) have hypothesized that the different ways in which native and nonnative speakers prioritize and parse syntactic and semantic information are central to understanding the qualitative differences in L1 and L2 language use. To date, however, no study has attempted to bridge the gap between attention and processing in order to discover how the natural complexity of form and meaning available in just one lexical item affects the prioritization of meaning over form. This study examines these variations in input and attempts to determine whether it is complexity of meaning, of form, or some combination of the two that has the greatest impact on the attentional system and the processing of a second language.
To do this, this study makes use of the natural shades of syntactic and semantic complexity made available by the various instantiations of phrasal verbs in English. Syntactically, phrasal verbs are capable of appearing in two different forms ((a) and (b) below). Semantically, these items can be either directional, in which the particle of the phrasal verb retains some part of its inherent directional quality (e.g., throw away, pick up) or metaphorical, in which the particle has no directional meaning (e.g., tear up, blow up). Comparison of these syntactic and semantic alterations can be accomplished by creating groups of sentences as seen below.

a. Susan **threw away** the piece of paper before she left class. (directional, contiguous)

b. Susan **threw** the piece of paper **away** before she left class. (directional, separated)

c. Susan **tore up** the piece of paper before she left class. (metaphorical, contiguous)

d. Susan **tore** the piece of paper **up** before she left class. (metaphorical, separated)

Participants (66 learners of English and 16 native speakers) were tested by use of a sentence repetition task and a self-paced reading task, which were then analyzed to determine how variations in syntactic and semantic complexity
affected speakers’ ability to attend to variations in form, their comprehension of the input, and processing time.

Results showed that semantic and syntactic complexity played a significant role ($p=.0009$) in determining whether nonnative speakers would be able to attend to syntactic variations in aural input, as determined by correct recitations of sentences containing a phrasal verb in the sentence repetition task. Further, learners were significantly less likely to correctly answer a comprehension question about a sentence containing a phrasal verb that was both syntactically and semantically complex ($p=.0007$). However, only syntactic complexity was a statistically significant factor in determining whether participants would experience a greater processing load in reading a phrasal verb construction ($p=.0094$). Evidence from this study shows that meaning making remains a priority over attention to form in processing even when a lexical item contains elements of syntactic variability.
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## List of Abbreviations

- **ANOVA**: Analysis of Variance
- **CEFR**: Common European Framework of Reference
- **EPI**: English Program for Internationals
- **L1**: First (native) language
- **L2**: Second language
- **NP/PP/VP**: Noun Phrase/Prepositional Phrase/Verb Phrase
- **NS**: Native speaker(s)
- **NNS**: Nonnative speaker(s)
- **SLA**: Second Language Acquisition
- **UG**: Universal Grammar
CHAPTER 1

INTRODUCTION

1.1 STATEMENT OF THE PROBLEM

Maintaining language learner focus on communication and meaning-making in the foreign language while simultaneously encouraging noticing of grammatical structures is an important goal for practitioners of second language acquisition (SLA). This same matter has been a great catalyst for theory and research in SLA, as researchers investigate the nature of the dichotomy between the treatment of syntactic and lexical-semantic items in language learner attention and processing.

Perhaps the most influential research in this field has been VanPatten’s seminal investigation of attention to form and meaning (1990) and his subsequent model of Input Processing (1994, 2004a, 2007), which state that learners have a limited capacity for attending to nuance in linguistic input and their primary motivation is to make meaning out of the input. As a result of the drive to make meaning, content words are prioritized in processing, and grammatical items that do not pertain to meaning-making are processed only when sufficient resources are available after the processing of content words, if at
all. That is, if the burden of making meaning from the input is such that attentional resources are depleted, grammatical forms go unprocessed.

This division of attentional resources between lexical-semantic and grammatical-structural information is also of interest from an online grammatical processing viewpoint, as seen in the work of Clahsen and Felser (2006, 2009) and Sorace (2006). Clahsen and Felser claim that although L1 and L2 adult speakers both possess a dual processing mechanism consisting of a system for lexicon and a computational system for forming expressions, the processing mechanism behaves differently for each group. Adult L1 speakers employ an integrated use of the system, while adult L2 speakers rely primarily on the lexical-semantic system and underuse available syntactic information, ultimately resulting in less efficient and less complete language processing. Further, Sorace (2006) notes that constructions that are more complex, such as interface constructions, may exacerbate this problem and lead to more problematic processing.

A necessary step in the processing of language, according to VanPatten (2004a), is first noticing an item in the input. Noticing, as introduced by Schmidt (1990), is the conscious registration of linguistic material in the input. After input has been noticed, it may be processed and made available for further processing and can subsequently be integrated into the linguistic system. Thus, content items necessary for the comprehension of input must be noticed in order for
processing to occur. Grammatical input that is not central to the making of meaning can be assumed to be noticed less frequently.

However, a strict division of grammatical-structural and lexical-semantic linguistic material does not account for items that contain elements of both of these categories. One such item, the English phrasal verb construction, has gone unexplored in this regard in the SLA literature. It has not yet been investigated whether the structural variability sometimes available to phrasal verbs must be attended to in order for processing of input containing the construction to occur. This structure, which offers variation in both syntactic and semantic complexity, seems to have the possibility of complicating processing for the L2 learner, who is believed to rely heavily on lexical-semantic cues in processing.

This study explores how the variations in syntactic and semantic complexity in the English phrasal verb construction affect learners’ ability to attend to variations in structure, their efficiency in processing input, and their comprehension of input. By increasing syntactic and semantic complexity, both together and separately, this study attempts to determine which linguistic information is prioritized when attentional resources are exhausted, and investigates whether comprehension is impacted by these variations. Further, since the structural and semantic variations under investigation in this study occur naturally and frequently in English, evidence from this study provides
valuable information on how learners process a salient construction in English. The link between attending to structure and processing of the input is also explored, and the problem of noticing both form and meaning in a single lexical item is investigated.

1.2 DEFINITION OF TERMS

Attention - According to Tomlin and Villa (1994), attention is a limited-capacity system that affects both which linguistic input is processed and the duration of processing.

Detection - The process by which stimuli are registered and made available for learning (Tomlin and Villa, 1994).

Input - The linguistic material to which the language learner is exposed; it may be spoken or written.

Intake - According to Schmidt (1990), this is input that has been consciously noticed. For Tomlin and Villa (1994), the learner does not need to be aware of detecting the input for it to become intake. VanPatten (2004) argues that input must be both noticed and assigned a meaning in order to become intake. Intake is generally considered to be the subsection of the input that is available for further processing and learning.
**Noticing** - The conscious registration of linguistic material in the input (Schmidt, 1990).

**Phrasal Verb** - The phrasal verb is a multi-word lexical construction consisting of a verb and a particle which, when taken together, have a single meaning. This meaning may be compositional or non-compositional in nature; in a compositional verb, the meaning of each part of the phrasal verb contributes its original semantic value to the meaning of the whole. A noncompositional verb, on the other hand, is not semantically combinatorial in this way.
CHAPTER 2

REVIEW OF THE LITERATURE

The question of how syntactic and semantic complexity affect both language processing and comprehension by second language learners has spurred theoretical models and empirical studies from both an attentional angle and from the viewpoint of online grammatical processing. I begin this chapter by discussing the online grammatical processing of semantics and syntax from a psycholinguistic SLA perspective and explore how some of the major tenets of this research relate to the existing research in attention to form and meaning. This research is in turn connected to several attentional frameworks in SLA, and the relationship between attention and processing in language learning is explored, including a review of how the concept of attention to form and meaning has been investigated in the literature. I end by explaining how the perspectives for analyzing semantic and syntactic attention and processing in language learners come to bear in rationalizing the current study.
2.1 PROCESSING OF FORM AND FUNCTION: 
PSYCHOLINGUISTIC PERSPECTIVES IN SECOND LANGUAGE ACQUISITION 

The division of attention between meaning-bearing features of language and morphosyntactic constructions has long been of interest to researchers and practitioners of SLA. This dichotomy has also been discussed from a psycholinguistic standpoint in SLA over the past several years. In this section, I discuss the concept of a dual processing mechanism for parsing lexicon and syntax in both native speakers and second language learners, explore alternate accounts of processing phenomena, and then transition to discussing form and meaning research in second language acquisition.

2.1.1 THE DUAL MECHANISM FOR PROCESSING AND THE SHALLOW STRUCTURE HYPOTHESIS

Clahsen and Felser (2006)

Observing a lack of studies in the literature that examine online processing by language learners, Clahsen and Felser (2006) set out to investigate how real time grammatical processing of a target language by adult language learners compares to that of adult native speakers and child L1 language learners. Through an examination of previous studies by various researchers, Clahsen and Felser gather evidence about grammatical processing by the three groups mentioned above.
An important conclusion drawn by the accumulation of their data is that all three groups employ a dual mechanism for grammatical processing consisting of a system for lexicon entries and a computational system to form expressions from these lexical items. However, there are differences in how this system is employed by each group. Adult native speakers display the most integrated use of the system, using both structural and lexical cues in grammatical processing. Child L1 learners, on the other hand, use mostly syntactic cues in processing, and make little or no use of lexical-semantic cues. Adult L2 learners differ from both adult native speakers and child L1 learners in primarily employing the lexical-semantic system in processing, often underusing available syntactic information.

Clahsen and Felser therefore conclude that while the dual processing mechanism exists for both L1 and L2 speakers, there are qualitative differences in the syntactic representations formed by the two groups during grammatical processing, a concept that they label the shallow structure hypothesis. According to the shallow structure hypothesis, adult native speakers employ structural representations that are much more sophisticated than the ‘shallow’ representations of adult L2 learners. The sophisticated representations produced by the native speakers’ systems allow them to parse their native language with greater speed and accuracy than adult L2 learners, who must rely on representations that lack the detail present for native speakers. As a result, adult
L2 learners process the target language less efficiently and less completely than native speakers.

Further, Clahsen and Felser point out that the idea of shallow representations is not limited to nonnative speakers. Several hypotheses exist that suggest that native speakers also employ shallow processing under certain circumstances (Ferreira, Bailey and Ferraro, 2002; Fodor, 1995), especially when dealing with sentences that are more difficult to process, such as implausible passives (“The dog was bitten by the man.”) and garden-path sentences (“While Anna dressed the baby played in the crib.”) (34). Clahsen and Felser conclude that shallow processing is simply a feature available in any language comprehension system, but while it is only occasionally employed in native language parsing, adult learners are always restricted to shallow representations when processing the L2.

In a commentary on Clahsen and Felser’s shallow structure hypothesis, Sorace (2006) focuses on the optionality of shallow representations in speakers. Specifically, she suggests that shallow processing may be employed as a relief strategy when speakers are faced with complex structures that impose a “greater than normal processing load” (88). She argues that interface constructions that require the speaker to activate, for example, elements of both syntax and pragmatics are more likely to cause greater processing loads and therefore result
in shallow representations. This idea is important in the current study, in which a construction that simultaneously plays a role in the syntax and semantics of the sentence is manipulated into variations of syntactic and semantic complexity. If it is true that the more complex iterations are more likely to push learners into use of shallow representations as a relief strategy, we should see evidence of problematic processing in those sentences with a combination of complex syntax and semantics.

*Clahsen and Felser (2009)*

In a follow-up to their (2006) contribution introducing the shallow structure hypothesis, Clahsen and Felser examine listening data from both child L1 learners and adult L2 learners in order to study parsing strategies and processing capacity limitations in these two groups of speakers. Using auditory processing evidence from various studies, the researchers outline clear differences in the processing of adult native speakers, child L1 learners, and adult L2 learners, echoing the conclusions reached in their (2006) article. Results from these studies indicate that while child L1 learners and adult native speakers possess syntactic processing abilities that are very similar, adult L2 learners do not appear to have access to these same syntactic processing strategies. Clahsen and Felser claim that it is the difference in structural representation that accounts for slower and less accurate processing of the target language by adult L2
learners, and not any difference in lexical access or working memory. While both adult native speakers and child L1 learners show evidence of using various syntactic parsing strategies in analyzing their native language, adult L2 learners tend to rely on lexical-semantic information rather than grammatical-structural cues.

2.1.2 ALTERNATIVE ACCOUNTS FOR SECOND LANGUAGE PROCESSING

While the current study focuses primarily on the dual mechanism for processing morphosyntax and lexical-semantic cues as described by Clahsen and Felser (2006) and VanPatten (1994, 2004a, 2007), it is also useful to examine other accounts of second language processing. In this section that follows, I review two such accounts, and describe how they contribute to the discussion of the current study.

MacWhinney (2005)

In a (2005) update on his Competition Model (1987), originally formulated to account for first language acquisition and sentence processing, MacWhinney offers a unified version of the model designed to incorporate second language learning into the existing concept. At the heart of his model is the idea that the language processing system selects between competing cues from a variety of linguistic arenas (such as phonology, lexicon, and morphosyntax) in order to map
form to function. The outcome of various competitions between cues depends upon the strength of the cues in question. Cue strength, in turn, varies by language; for example, word order is a strong cue in English, but less so in case-marking languages in which word order is not as restricted as it is in English.

When input to be processed contains cues that agree, there is no competition among the cues and comprehension decisions are made quickly. However, the slowest processing occurs when there are a variety of strong cues in the input that compete. Unlike Clahsen and Felser’s (2006, 2009) account above, MacWhinney’s model is not based on a dual mechanism for processing lexicon and computing expressions, instead stating that processing occurs when linguistic cues from the various arenas have been weighed for their cue strength and an interpretation has been chosen on this basis. Further, while Clahsen and Felser account for differences in L1 and L2 processing by stating that L1 speakers utilize an integrated system of processing syntactic and lexical-semantic cues and L2 speakers rely primarily on lexical-semantic cues, MacWhinney’s model mainly cites cue strength transfer from the L1. While the concept of cue strength provides an interesting alternative account for the processing of form and function as discussed in this chapter, the functioning of L1 transfer in this case is more difficult to define, as the target structure in question does not appear in the L1 grammars of the participants. However, there are likely other transferred cues
that are relevant in the processing of the target structure, which would certainly be a rich area of inquiry in future studies.

White (1991)

White’s (1991) work on the functioning of Universal Grammar (UG) in SLA extends beyond the work of the current study to issues of ultimate attainment in child and adult L2 learners that are not at issue in this investigation; however, her definitions of the components of processing are relevant to the work at hand. White contends that there are four important distinctions to be made concerning processing strategies and language acquisition. The first of these is between competence and performance, and the second is between reception and production.

White argues that while evidence of processing strategies are generally used in SLA literature to account for learner competence, they are actually only evidence of how the language is being used on a given occasion. That is, there is a distinction between a learner’s language ability (competence) and his performance on a task.

The second distinction relates to language comprehension and production. She claims that a contrast must be made between processing of the input (reception) and the output that results from this processing (production). Further, she contends that the processing strategies used in L2 acquisition either
play a role in processing input or in producing output, and that it is only the strategies for processing input that may be required for the acquisition of language. Production strategies, on the other hand, may not play any role in acquisition. While White’s account differs from the other concepts at issue in this study, her distinction between reception and production should be considered when interpreting the data collected.

2.2 INPUT PROCESSING AND ATTENTION TO FORM AND MEANING

The concept of L2 learners’ reliance on lexical-semantic cues over structural information, important in Clahsen and Felser’s (2006, 2009) work above, also plays a central role in a major area of inquiry in the field of SLA. VanPatten’s (1994, 2004a, 2007) work on Input Processing has had a significant impact on the field of attention to form and meaning in SLA, and takes into account both the processing of semantic and syntactic information, as discussed in section 2.1.1, and the concept of input noticing, which will be explored later in this chapter.

VanPatten’s model of Input Processing concerns itself with understanding the restrictions on the limited capacity nature of attention. According to VanPatten, the push to get meaning from input is primary for the nonnative speaker, and because there exist limited resources for processing input, certain
linguistic input will not be processed. Often the input that is not processed is that which does not pertain to the making of meaning. For VanPatten, processing requires a form to be noticed and linked to a meaning and/or function. However, input does not have to be linked to a correct form or meaning in order to have undergone processing; forms can still be considered to have been processed even if they have been linked to an incorrect meaning and/or function.

In a 2007 update of the input processing model, VanPatten outlines ten principles of second language processing:

Principle 1: The Primacy of Content Words Principle. Learners process content words in the input before anything else.

Principle 2: The Lexical Preference Principle. Learners will process lexical items for meaning before grammatical forms when both encode the same semantic information.

Principle 3: The Preference for Nonredundancy Principle. Learners are more likely to process nonredundant meaningful grammatical markers before they process redundant meaningful markers.

Principle 4: The Meaning Before Nonmeaning Principle. Learners are more likely to process meaningful grammatical markers before nonmeaningful grammatical markers.
Principle 5: The First Noun Principle. Learners tend to process the first noun
or pronoun they encounter in a sentence as the subject.

Principle 6: The L1 Transfer Principle. Learners begin acquisition with L1
parsing procedures.

Principle 7: The Even Probability Principle. Learners may rely on event
probabilities, where possible, instead of the First Noun Principle to
interpret sentences.

Principle 8: The Lexical Semantics Principle. Learners may rely on lexical
semantics, where possible, instead of the First Noun Principle (or an L1
parsing procedure) to interpret sentences.

Principle 9: The Contextual Constraint Principle. Learners may rely less on
the First Noun Principle (or L1 transfer) if preceding context constrains
the possible interpretation of a clause or sentence.

Principle 10: The Sentence Location Principle. Learners tend to process items
in sentence initial position before those in final position and those in
medial position.  (p. 116)

While each of these principles plays a role in VanPatten’s overall theory of
second language processing, it is the first principle that has garnered the greatest
amount of attention in SLA research, and which plays the most important role in
the current study. This principle is a slight reformulation of his Primacy of
Meaning Principle (2004), which stated that “learners process input for meaning before they process it for form,” (7). Simply stated, learners are primarily motivated to make meaning out of language, and they will therefore attune the limited-capacity system of attention to those parts of the utterance (generally lexical items such as nouns and lexical verbs) that will assist the learner in making specific form-meaning connections. Because attention is of limited capacity, grammatical items, such as inflection and tense, and noncontent words, such as determiners and auxiliaries, are likely to be processed after content words, if at all.

VanPatten’s model does not explore, however, whether processing is impacted when a lexical item also contains elements that are not associated with making meaning, but are simply syntactic in nature. The current study will examine this question by investigating how learners process a content item made syntactically and semantically complex by use of natural variations in the English language.

VanPatten differentiates his concept of processing, as discussed above, from the concept of noticing. For VanPatten, noticing does not require any connection of form to meaning, but simply requires that the form has been registered. Input can therefore be noticed without being processed, but must be noticed if it is to be processed. In the following section, I examine the models of
attention that come to bear in understanding the concepts of noticing and attention that are explored in this study.

2.3 MODELS OF ATTENTION IN SECOND LANGUAGE ACQUISITION

Richard Schmidt’s (1990) noticing hypothesis has been the catalyst for many responses and theories regarding attention in language learning. In it, he lays out an argument intended to counter the contention posited by second language researchers such as Krashen (1981) and Seliger (1983) that the acquisition of a second language occurs in large part at the unconscious level, and that conscious learning plays an insignificant role in the acquiring of a second language. Schmidt takes issue with Krashen’s claim that the only genuine form of learning is acquisition, which must take place on the subconscious level, and that conscious learning (as generally occurs in the classroom) is not particularly useful in language production or comprehension. Krashen also argues that learning can never become acquisition, and that there exists a necessary dichotomy between conscious and unconscious learning.

Schmidt argues that, on the contrary, the conscious registration of linguistic material (which he labels “noticing”) is a necessary step in the process of language learning. He does not make the distinction between the concepts of learning and acquisition which is central to Krashen’s work, instead using the
terms interchangeably. The current study also takes this view of learning and acquisition, which is likewise consistent with VanPatten’s model of Input Processing (2004a), in which he states that the mechanisms for processing language should be the same regardless of whether the language is acquired naturalistically or is learned in a classroom.

Under Schmidt’s hypothesis, learning occurs when linguistic input becomes intake. Noticing, in turn, is limited by certain factors, such as frequency in the input, salience of the input, and the skill level of the learner. Noticing is necessary to subsequent language learning, but is not of itself sufficient to ensure that learning will occur. After input becomes intake, the learner must establish generalized rules and form hypotheses about the nature of the language, at which point learning occurs. However, this process cannot begin at all, according to Schmidt, without the initial noticing having taken place. VanPatten (2004a) links Schmidt’s concept of noticing to processing in the following manner: once input has been noticed, it may be processed (i.e., a connection is made between form and meaning), at which point the input becomes intake and is made available for incorporation into the developing linguistic system.

Importantly, however, Schmidt does not claim that noticing need be a result of deliberate attention to a particular form. Any part of the input that is consciously noticed can become intake, and Schmidt therefore claims that it is
impossible for what he calls ‘subliminal language learning’ to take place. Further, he notes that while incidental learning is possible, it is unlikely unless a task requires attention to certain parts of the input, thereby facilitating the process of noticing.

Tomlin and Villa’s (1994) model of attention in second language acquisition attempts to present a more nuanced look at attention than that laid out in Schmidt’s noticing hypothesis. While Schmidt does not specifically outline his concept of awareness in his (1990) hypothesis, Tomlin and Villa take his noticing hypothesis to mean that noticing critically requires awareness of the input, and that awareness and attention are both central to noticing.

While Tomlin and Villa mostly concur with Schmidt’s hypothesis, they believe that a more specific account of the cognitive functions involved in attention is necessary. They argue that attention is a limited-capacity system, and that the limited capacity of attention has implications for the amount of material that can be processed as well as the duration of processing. Furthermore, they argue that attention controls the receipt of cognitive resources by given linguistic features, and that measuring reaction times can be useful in investigating the cognitive control of attentional resources. These two concepts, which do not play a large role in Schmidt’s focus on consciousness in learning, are important to the examination of attention in the current study, which uses variations in
complexity in an attempt to challenge the limited-capacity system, and measures the processing of the variations with a reading time task.

Tomlin and Villa’s concept of attention can be broken down into three major functions: alertness, orientation, and detection. Alertness refers to readiness to deal with input. In the context of second language acquisition, alertness is the indication that learners are “generally ready to process information or learn,” (191). The concept of orientation, however, has a much more specific ramification for language learning. Orientation refers to focusing attention on a particular stimulus in the input.

The third concept, detection, most closely mirrors Schmidt’s notion of noticing. Detection refers to the process by which stimuli are processed in the memory and are therefore available for learning. In this way, therefore, Tomlin and Villa’s model echoes Schmidt’s hypothesis that noticing (or detection) is a necessary element for language learning. More specifically, the concept of detection includes the idea that linguistic information that is detected can cause interference with the processing of other information, thereby exhausting attentional resources.

Tomlin and Villa also outline the idea of cognitive awareness. Awareness refers to a learner’s having some perception of the fact that they have undergone some learning experience. According to Tomlin and Villa, none of the
components of attention described above require awareness; although awareness necessarily requires attention, attention can occur without awareness. As such, a learner can detect a stimulus (and therefore learn language) without having been aware of doing so. This, then, appears to be a conflict between Schmidt’s noticing hypothesis and the model laid out by Tomlin and Villa; Schmidt believes that noticing must occur on a conscious level, while Tomlin and Villa believe that awareness of learning is not necessary.

Robinson’s (1995) review on the state of theoretical models of attention in SLA differs from the previous models by defining a role for memory in the model of attention. Robinson begins by describing three uses for the concept of attention. The first refers to the process of noticing stimuli that will be subsequently processed and stored in memory. Second, attention is used to refer to a learner’s capacity to process information, and finally, it can describe the cognitive effort needed to process information. Robinson argues that each of these aspects of attention plays a role in current models of attention in second language acquisition, although he primarily focuses on the first.

Robinson argues that the conflict evident between Schmidt on the one hand and Tomlin and Villa on the other could be cleared up by stipulating that noticing requires not only detection but also rehearsal in short-term memory. Following a model of attention and memory posited by Cowan (1993), Robinson
claims that “activation in short-term memory must exceed a certain threshold before it becomes part of awareness” (297). Therefore, while detection can occur without awareness, noticing cannot, and it is noticing (and not simple detection) that leads to encoding in memory and therefore in learning. Robinson thus redefines the relationship between detection, attention and awareness on this basis. While attention is necessary for both detection and noticing (and therefore learning), awareness is only necessary in noticing and not in detection. Under this model, noticing is evidence that the information has been encoded in short-term memory and is consequently available for learning. Robinson therefore believes that there is little evidence that learning can occur without awareness, as Tomlin and Villa seem to argue. Rather, he takes the view, consistent with Schmidt’s noticing hypothesis, that stimuli need to be not only detected but also noticed in order for learning to take place.

In summary, it is possible to delineate several important points of agreement and contention between these three major models of attention in second language learning. Significantly, all of the researchers seem to agree that the capacity of a learner’s attention is limited, and that therefore a learner cannot possibly attend to all of the linguistic information in a given utterance. They therefore agree that of all the possible input in an utterance, only some will be converted to intake. The essential differences between these models seems to be
in focus (the role of consciousness for Schmidt, the subdivision and categorization of the concept of attention for Tomlin and Villa, and the role of memory for Robinson) and in scale. That is, the models do not generally disagree about the major functioning of attention in language learning, but rather they disagree about the extent to which the various subsegments of attention are important to second language learning. The current study does not attempt to cover all of the various facets of attention outlined by these models of attention. Instead, it focuses on certain aspects of attention that have yet to be sufficiently explored in empirical studies on SLA, such as the depletion of the attentional system by use of the natural variations of complexity in linguistic input, and how these concepts link with existing ideas in studies on grammatical processing in SLA.

In the section that follows, I outline the major empirical contributions to the study of attention to form and meaning in SLA.

2.4 Empirical Studies

VanPatten (1990) and replications

VanPatten’s (1990) study on learners of Spanish explored the nature of learners’ limited capacity to deal with stimuli. For this study, 202 university level learners of Spanish (L1 English) were given four different listening tasks:
Task I. Listening for content (control task)

Task II. Listening for content while taking note of a key lexical item (inflation)

Task III. Listening for content while noting the feminine definite article (la)

Task IV. Listening for content while noting the verbal morpheme -n

In order to determine that learners were indeed attending to the forms in tasks II, III and IV, learners were required to make a check mark every time they heard the target form. Only participants who had noticed at least 60% of the target forms in each instance were included in the results. Comprehension of the text was measured by means of a free recall task, in which students wrote down in English everything they could remember from the listening.

Results from the four tasks showed that students received the highest recall scores when attending to content only (Task I) and to content and the lexical item (Task II). Recall scores were significantly lower when students were required to attend to grammatical forms (Tasks III and IV). VanPatten concluded that conscious attention to form limits the capacity of the processor and therefore reduces the learner’s ability to attend to meaning.
This study has spurred numerous replications that either explored a different aspect of attention to form and meaning or repaired an apparent inconsistency or flaw in methodology design. In this section, I will discuss some of these replications and how they have deviated from the original study.

Greenslade, Bouden and Sanz’s (1999) replication of VanPatten’s (1990) study explored whether VanPatten’s conclusions about attention to form and meaning are reproducible when learners are subjected to written, rather than aural, input. Using 62 university level Spanish students, Greenslade et al. created a reading comprehension task that was a direct copy of VanPatten’s listening task. Learners were given a time limit of 2 minutes and 30 seconds, in an attempt to parallel the intrinsically temporal nature of the listening activity in VanPatten’s study. However, instead of checking off instances of the target form on a separate sheet of paper, as in VanPatten’s study, Greenslade et al. required learners to simply underline or circle the form in the reading passage.

Using the same tasks and recall protocols as VanPatten (1990), Greenslade et al. found similar results to those of VanPatten: the control group (attending only to meaning) received the highest recall scores, while the group focusing on la received the lowest scores. However, Greenslade et al.’s results included one major difference from VanPatten’s; there was no significant difference in recall scores for the lexical group (inflation) and the group focusing on the morpheme -
Despite this difference, Greenslade et al. concluded that VanPatten’s conclusions about attention to form and meaning can be generalized to the written mode.

Wong’s (2001) partial replication of VanPatten’s study used L1 French - L2 English learners, rather than learners of Spanish as in the other studies, and studied comprehension in both the aural mode and the written mode. Mirroring the findings of both VanPatten and Greenslade et al., Wong found that in both the written and aural modalities, learners who attended only to content produced the highest mean recall scores, followed by those attending to the lexical item inflation and the grammatical item the (the inflectional morpheme -n was not included in this study, as an equivalent form does not exist in English). Further, all of the recall scores in the written mode were higher than any of the scores in the aural mode. However, when submitted to a GLM ANOVA test, no statistically significant difference was found between the lexical (inflation) group and the grammatical (the) group in the aural group. In the written mode, Wong, like Greenslade et al., found no significant difference between the content only group and the inflation group. However, she also found no statistically significant difference between any of the other tasks in the written mode. Wong therefore concluded, like VanPatten, that comprehension of aural input was impeded by focused attention to a definite article. In the written mode, she found that
attending to the various forms did not negatively affect comprehension. Finally, she found that modality does affect attentional capacity, and that learners are better able to deal with attentional constraints in the written mode than in the aural mode.

In another partial replication of VanPatten’s (1990) study, Leow, Hsieh and Moreno (2008) attempted to rectify some of the methodological issues with the previous studies on attention to form and meaning. First, they changed the choice of the lexical item (inflación) to sol, citing the need for a non-cognate and a word whose length and saliency was more similar to the other elements that participants were asked to focus on (la, -n). They also added an element for focus, the clitic lo, which has both form and meaning, and was therefore intended to bridge the gap between lexical and morphological items. Leow et al. also modified the comprehension assessment by employing a multiple choice comprehension task, which they believed would be more reliable than the recall task used in the previous studies. Finally, Leow et al. gathered qualitative data by having participants perform think-aloud protocols in order to operationalize attention in the study and to ensure that participants were in fact attending to both form and meaning as they read. The results of the study did not find significant differences in comprehension between the various groups, indicating that attending to form and meaning may not have an effect on comprehension in
the written mode. Since the addition of the think-aloud protocol may have caused differences in results between this study and previous studies, Leow et al. suggest that more research into input processing in the written mode is needed.

Gass et al. (2003)

Gass, Svetics and Lemelin (2003) explored how focused attention affects three different linguistic areas (syntax, morphosyntax, and lexicon). Based on the idea that attention is a limited-capacity system, Gass et al. hypothesized that learners pay more attention to certain aspects of language than others, and as a result, that focused attention would affect the various aspects of language differently. They further predicted that focused attention would have the greatest effect on lexicon, as the least complex and abstract aspect of language, and would have the least effect on syntax (the most complex and abstract of the three).

To operationalize this study, Gass et al. focused on pronoun affixation for the morphosyntax category, question formation for syntax, and five words unknown to participants for the lexical category. The participants, 34 L1 English learners of Italian, were assigned to either a [+ focused attention] or [-focused attention] group and were tested using a computer program that subjected participants to one sentence at a time at a fixed interval. Posttests required learners to answer explicit questions about syntax, morphosyntax, lexicon, or comprehension, based on the learner’s group.
Results of the study found that learning occurred in all of the groups with the exception of the [-focused attention] syntax group. However, the results of focused attention were contrary to the hypotheses formed by Gass et al.; focused attention had the greatest effect on syntax and morphosyntax, and the least effect on lexicon. The researchers therefore concluded that focused attention on form is a useful tool for learning, and may even be necessary for more complex grammar rules (528).

Smith (2012)

This study, ostensibly created in order to examine the effectiveness of eye-tracking as a tool for looking at the concept of noticing, investigates whether learners of English noticed explicit corrective recasts from a native speaker in a computerized chat. Participants (N=18) were university level learners of English as a second language. After watching an animated video clip, learners were asked to retell the story to a native speaker interlocutor via an online chat. During this chat, an eye-tracking program enabled with heat mapping was used to log learners’ eye movements. This heat map provided coloration to indicate which segments of the chat (and therefore which recasts, if any) the participants focused on. After the chat, learners took part in a stimulated recall with the researcher, in which he pointed out recasts in the chat and asked participants
whether they noticed the recast when it occurred during the chat. Participants then took a post-test based on items for which they had received a recast.

Results of the study showed that both the eye-tracking data (that is, recasts on which the learners focused for longer periods of time) and stimulated recall were accurate measures of noticing, by predicting success on the post-test. However, the eye-tracking program was more successful than the stimulated recall, and was able to produce more fine-tuned predictions. The researcher therefore concludes that eye-tracking technology is a valuable tool in investigating noticing in second language acquisition.

2.4 Rationale for the Study

At the heart of both the major processing and attention models described in this review of the literature are two important ideas: the fact that attention and processing occur at a limited capacity and that therefore certain linguistic components are prioritized, and the concept of the dual system of syntactic form and semantic function. Studying learner processing of form and function is useful in examining the attentional system and the dual processing mechanism, and has the goal of helping us to understand how learners prioritize linguistic data, with or without being aware of doing so.
The current study proposes to bridge the gap between these two perspectives on form and function by investigating aspects of the theoretical models of attention that have been heretofore unexplored. As has been made clear in this review on the literature in attention studies in SLA, most of the empirical studies undertaken thus far have either manipulated the input received by students (Gass et al., 2003, for example) or have asked students to attend to a particular piece of the input (e.g., Leow et al., 2008; VanPatten, 1990; Wong, 2001), therefore testing attention by attempting to purposely direct focus at some part of the input. This valid and useful approach serves mainly to test whether, in deliberately directing the attention of the limited capacity processor to one aspect of the input, the attention given to other aspects of the input will suffer. The results of these studies lend themselves particularly well to making determinations on the utility of enhanced input in the foreign language classroom; if it is found that directing a learner’s attention to a particular form will increase learning of that form without causing overall comprehension to suffer, it will be useful to utilize these techniques in the classroom.

The current study, however, takes a alternative perspective on studying attentional capacity and as such employs a different methodology. While previous studies have centered on manipulating learners’ attention in order to study the effects of focused attention, the current study used the natural
complexity of form and meaning inherent in certain linguistic information in order to investigate whether variations in syntactic and semantic complexity result in exhaustion of attentional resources, as discussed by Tomlin and Villa (1994), and in greater processing loads, as described by Clahsen and Felser (2006) and Sorace (2006). This was investigated by observing how input of varying syntactic and semantic complexity affects learners’ ability to attend to structure in aural input, as judged by learner repetition of the input, and by examining reading times of the various syntactic and semantic variations.

With these criteria in mind, the English phrasal verb construction was deemed an ideal choice for the target structure in this study, as it lends itself naturally to adjustments of varying degrees of complexity in form and meaning. Additionally, despite its prevalence in the English language, the phrasal verb construction has up to this point gone unexplored in second language research on attention and processing. This structure is discussed in detail in the methodology chapter of this manuscript. As will be explored in the following chapter, the variations available in the use of this structure allow not only for the contrasts in syntactic and semantic complexity necessary for this study, but also admit the possibility of exploring how increasing the length of the form affects learners’ processing of the variations.
Also under investigation in the current study is how form and meaning affect comprehension of the input. While this concept has been explored in the literature previously (VanPatten, 1990 and replications), the current study also investigates the mapping of form to meaning from a perspective not yet present in the SLA literature, by manipulating the natural semantic and syntactic complexity of phrasal verbs in order to investigate how this complexity can lead to errors in comprehension.

Further, the study considers the relationship between noticing and processing by exploring the possible connection between attention to structure in aural input, processing efficiency, and comprehension of input. It also examines how prioritization of meaning-bearing items over functional items is affected by a construction that contains components of both, and examines whether processing of this multi-word lexical unit can occur without noticing of its syntactic elements.

Investigating the dual mechanism attentional and processing system will allow SLA researchers to come to a better understanding of how learners process language input and will ultimately assist practitioners in knowing how best to take advantage of the peculiarities of the system in order to help students learn.
2.5 RESEARCH QUESTIONS

RQ 1: Do syntactic and semantic complexity affect adult learners’ attention to variation in phrasal verb structure?

RQ 2: If so, to what extent do syntactic and semantic complexity affect:

(a) adult learners’ processing of written input?
(b) adult learners’ comprehension of written input?

RQ 3: To what extent does direct object weight affect:

(a) adult learners’ processing of written input?
(b) adult learners’ comprehension of written input?
CHAPTER 3

METHOD

3.1 RESEARCH DESIGN

In order to gather the information needed to answer the research questions stated above, this study employed two different tasks: a sentence repetition task and a self-paced reading activity. The sentence repetition task utilized aural input and spoken production in order to measure attention to variations in structure. Errors in repeating the sentences heard can be considered an indication of “underdeveloped psycholinguistic mechanisms” in the learner (Lee, 2003). Errors in repetition for this task were therefore assessed to determine which of the syntactic and semantic conditions under investigation were most likely to result in a failure to correctly attend to the structural information in the input.

The self-paced reading activity was designed to gather reading time data in order to determine whether different combinations of syntactic and semantic complexity affect second language learner processing of these items. This methodology has been recommended for use in studies on second language processing (Marinis, 2003) as well as studies in attention to form and meaning.
(VanPatten, 2007). Marinis notes that self-paced reading tasks are particularly useful in determining which linguistic segments are difficult to process, and at which points a reader encounters input which is unexpected and therefore requires reanalysis in order to process. The self-paced reading task is therefore well suited to this study, as it can allow a glimpse at the particular kinds of input that are exhausting attentional capacity and causing difficulty in processing. Participants in this task also answered comprehension questions designed to test whether comprehension was affected by the different syntactic and semantic conditions.

3.2 Participants

Participants for this study consisted of 66 non-native speakers of English and a 16 person native speaker control group. Native speaker participants were undergraduate students at the University of South Carolina. Non-native speaker participants were students of English at the English Program for Internationals (EPI) at the University of South Carolina. The English Program for Internationals is an intensive English institute which caters to beginning to intermediate-advanced learners of English. The students who participated in this study were members of the two highest level reading and vocabulary classes (levels 5 and 6) at EPI. Students are placed in these levels based on institutional placement test
scores, administrated five times a year at EPI. The participating course levels are designed to correspond to Common European Framework of Reference levels B1.2 (intermediate) and B2.1 (upper intermediate), and therefore the level 6 students are expected to be of higher proficiency in reading and vocabulary than the level 5 students. Of the 66 non-native speaker participants, 38 were level 5 students and 28 were level six students. Participants were native speakers of Arabic, Chinese, Korean, Japanese, Portuguese, Spanish, Turkish, and Vietnamese. See Appendix A for background data on participants.

3.3 TARGET STRUCTURE

Phrasal verbs are verb-particle constructions consisting of a verb and a prepositional form (called a particle) which combine together to form a single lexical item. Phrasal verbs are notoriously difficult for non-native speakers of English, due both to the particularity of their behavior and the fact that they do not appear in most other languages (Gardner and Davies, 2007). However, phrasal verbs are very common in English, and are vastly preferred by native speakers over single-word equivalents (Dagut and Laufer, 1985). As such, if non-native speakers of English hope to achieve native-like proficiency in English, it is very important that they master these forms.
3.3.1 **Syntactic Behavior of Phrasal Verbs**

Some common phrasal verb constructions in English include such verbs as *turn on, put off, break up, put on, take out,* and *hang up,* and are both syntactically and semantically distinct from verbs that take a prepositional phrase adjunct. The syntactic differentiation between these constructions becomes apparent under closer examination of the morphosyntactic functioning of these items in regards to distribution and subcategorization. In this section, I examine some of these syntactic characteristics and delineate the essential differences between transitive phrasal verb constructions and verbs with prepositional phrase adjuncts, using the sentences in (1) - (3) as examples of transitive phrasal verbs and sentences (4) - (6) as examples of verbs with prepositional phrase adjuncts.

**Phrasal verbs**

(1) The student **looked up** the word.

(2) My roommate **took out** the trash.

(3) The mailman **picked up** the package.

**Verbs with prepositional phrase adjuncts**

(4) The dog **looked up** the tree (at the cat who was sitting on a branch).

(5) The joggers **ran under** the bridge.

(6) The cat **hid under** the table.
3.3.1.1 *Passivization*

Transitive verb constructions in English are typically capable of appearing in two forms, traditionally labeled *passive* and *active*. The difference between these two forms is shown in item (7) below. In the active form (7a), the logical subject appears in the initial position in the clause, followed by the transitive verb and the direct object. In the passive form (7b), the logical direct object takes the initial position in the phrase and the logical subject is moved into a *by*-phrase or is made oblique.

(7) a. **The little girl** broke the **antique vase**.

   b. **The antique vase** was broken (by **the little girl**).

In examples (8) and (9) below, it is clear that only the transitive phrasal verbs are capable of appearing in both passive and active forms; attempting to apply these forms to the verb + PP constructions yields ungrammatical sentences.

(8) a. The word was **looked up** by the student.

   b. The trash was **taken out** by my roommate.

   c. The package was **picked up** by the mailman.

(9) a. * The tree was **looked up** by the dog.

   b. * The bridge was **run under** by the joggers.

   c. * The table was **hidden under** by the cat.
Because only direct object NPs can undergo passivization, it is clear that the NPs following the phrasal verbs in (1)-(3) are direct objects, while the NPs following the verbs in (4)-(6) are objects of the preposition.

3.3.1.2 Noun phrase alternation

Transitive phrasal verbs are also able to appear in two different forms in respect to the positioning of the direct object, either after the phrasal verb or in between the verb and particle. This ability, traditionally known as PARTICLE SHIFT or NOUN PHRASE INSERTION, is not available to verb + prepositional phrase constructions, as seen in (10) and (11) below.

(10) a. The student looked the word up.
   b. My roommate took the trash out.
   c. The mailman picked the package up.

(11) a. * The dog looked the tree up (at the cat who was sitting on a branch).
   b. * The joggers ran the bridge under.
   c. * The cat hid the table under.

Additionally, when the noun phrases in (10) are pronominalized, only the form that has the pronoun in between the verb and particle is grammatical (12). This form is still ungrammatical for the verb + prepositional phrase constructions in (13).
(12) a. The student looked it up. /* The student looked up it.
   
b. My roommate took it out. /* My roommate took out it.
   
c. The mailman picked it up. /* The mailman picked up it.

(13) a. * The dog looked it up.
   
b. * The joggers ran it under.
   
c. * The cat hid it under.

Phrasal verbs are also capable of taking direct objects of greater length, as seen in (14). However, when the direct object becomes too heavy (15), noun phrase alternation creates sentences of dubious grammaticality.

(14) a. Joe picked up the hat.
   
b. Joe picked up the hat with the red trim.
   
c. Joe picked up the hat with the red trim which his sister had worn yesterday.

(15) a. Joe picked the hat up.
   
b. Joe picked the hat with the red trim up.
   
c. ? Joe picked the hat with the red trim which his sister had worn yesterday up.
Like the data with passivization seen above, the behavior of these constructions with regard to noun phrase alternation seems to indicate that the noun phrase following the prepositions in the different forms are not the same kind of argument. Because the noun phrases following phrasal verbs are able to pronominalize and appear in different positions in the clause (in both passivization and noun phrase insertion), it seems clear that these noun phrases form constituencies in a different manner than in the verb + prepositional phrase constructions. In particular, these tests provide evidence that the phrasal verb constructions in (1) - (3) consist of a compound verb followed by a NP constituent (16), while the constructions in (4) - (6) consist of a single word verb followed by a prepositional phrase (17). This matter will be further explored as more evidence is presented.

(16) a. [looked up [the word]]
   b. [took out [the trash]]
   c. [picked up [the package]]

(17) a. [looked [up [the tree]]]
   b. [ran [under [the bridge]]]
   c. [hid [under [the table]]]
3.3.1.3 Substitution

The status of phrasal verbs as multi-word lexical items is further evinced by their ability to be substituted by single word equivalents, as seen in (18). The verb and preposition combinations in (19), however, are not capable of being grammatically replaced by a single verb. Instead, the verb can be replaced by another verb, but still requires the preposition that follows in order to retain grammaticality. This test provides evidence that phrasal verbs are a single verbal unit, while the prepositional verbs are verbs followed by prepositional phrases, as outlined in (16) and (17) above.

(18) a. The student looked up the word. / The student researched the word.

b. My roommate took out the trash. / My roommate removed the trash.

c. The mailman picked up the package. / The mailman lifted the package.

(19) a. The dog looked up the tree. / *The dog glanced the tree. / The dog glanced up the tree.

b. The joggers ran under the bridge. / *The joggers raced the bridge. / The joggers raced under the bridge.
c. The cat hid under the table. / * The cat crept the table. / The cat crept under the table.

3.3.1.4 Adverbial modification

Although the verb and preposition in items (1) - (3) can be separated by the noun phrase direct object, it does not appear that they can be separated by other phrases, such as adverbial modifiers (20). The verb + preposition sequence in (4) - (6), however, can be separated by an adverb modifier (21), but not by an object.

(20) a. * The student looked quickly up the word. / The student (quickly) looked up the word (quickly).

b. * My roommate took quickly out the trash. / My roommate (quickly) took out the trash (quickly).

c. * The mailman picked quickly up the package. / The mailman (quickly) picked up the package (quickly).

(21) a. The dog looked quickly up the tree (at the cat who was sitting on a branch).

b. The joggers ran quickly under the bridge.

c. The cat hid quickly under the table.

Adverbs can generally occur after the verbs that they modify (22), provided they do not separate a verb from one of its arguments. Since direct objects are
arguments of transitive verbs, therefore, the adverb cannot come between the
two, but must appear either before or after the verb/direct object chunk (23).

(22) a. The commentator speaks quickly.

b. The runner ran quickly to the finish line.

(23) a. * The boy kicked quickly the ball. / The boy (quickly) kicked the ball (quickly).

b. * The correspondent wrote quickly a dispatch. / The correspondent (quickly) wrote a dispatch (quickly).

Clearly, the syntactic behavior of the phrasal verb constructions in (20) with
respect to the positioning of adverbial modifiers mirrors that of the verb + direct
object constructions in (23), rather than the verb + prepositional phrase
constructions in (22). This data provides further evidence that the constructions
in (1) - (3) are in fact phrasal verbs consisting of a verb and a preposition
followed by a noun phrase direct object and those in (4) - (6) are single word
verbs followed by prepositional phrases, as outlined in (16) and (17).

3.3.1.5 Wh- question formation

The two verb + preposition constructions also behave differently when it
comes to forming Wh- questions. While the verb + prepositional phrase
constructions are capable of forming wh- questions either with or without the
preposition before the *wh-* word (25), phrasal verb constructions are not capable of forming *wh-* questions headed by the preposition (24).

(24)  a. What did the student **look up**? / * **Up** what did the student look?

b. What did my roommate **take out**? / * **Out** what did my roommate take?

c. What did the mailman **pick up**? / * **Up** what did the mailman pick?

(25)  a. What did the dog **look up**? / ? **Up** what did the dog **look**?

b. What did the joggers **run under**? / **Under** what did the joggers **run**?

c. What did the cat **hide under**? / **Under** what did the cat **hide**?

Additionally, we find that the responses to the questions in (24) and (25) can differ. While it is possible to answer the questions in (27) either by simply giving the missing noun phrase or by repeating the preposition and giving the entire prepositional phrase, it is only possible to answer the questions in (26) by providing the noun phrase direct object.

(26)  a. What did the student **look up**?

The word. / * **Up** the word.
b. What did my roommate take out?

The trash. / * Out the trash.

c. What did the mailman pick up?

The package / * Up the package.

(27)  

a. What did the dog look up? / Up what did the dog look?

The tree. / Up the tree.

b. What did the joggers run under? / Under what did the joggers run?

The bridge. / Under the bridge.

c. What did the cat hide under? / Under what did the cat hide?

The table. / Under the table.

The inability of the preposition to separate from the verb in (24) and the impossibility of answering the questions as a prepositional phrase in (26) provides further proof that the preposition following the verb in the phrasal verb items (1) - (3) does not form a constituent with the NP that follows, as it does in the items (4) - (6). Rather, this test provides evidence that the preposition is part of a larger phrasal verb construction, in a way that the prepositions in (4) - (6) are not.
3.3.1.6 *Prepositional phrase modification*

Working under the assumption that the items in (4) - (6) are prepositional phrases and that those in (1) - (3) are not, certain tests can be performed that distinguish prepositional phrases from other items. If the assumption is correct, these tests should produce grammatical results for the sentences in (4) - (6) and ungrammatical results for (1) - (3). One of these tests is prepositional phrase modification.

Prepositional phrases are capable of being modified by the prepositional phrase modifiers *right, straight,* and *clear,* as seen in (28). When used as prepositional phrase modifiers, these words do not retain the meaning that they have when functioning as adjectives, but rather work to intensify the prepositional phrase. Notice that these words cannot modify noun phrases, adjective phrases, or adverb phrases (29).

(28)  
   a. The bird flew *right/straight/clear* over the trees.
   b. My brother ran *right/straight/clear* into the kitchen.

(29)  
   a. * He was a *right/straight/clear* teacher.
   b. * My sister is *right/straight/clear* blonde.
   c. * The journalist writes *right/straight/clear* quickly.\(^i\)

\(^i\) Note, however, that certain speakers of dialects of British English and Southern American English are capable of using *right* as a modifier of adjectives and adverbs, e.g. *He is right smart; He ran right quickly.* Nevertheless, I have been unable to find any examples of *right/straight/clear* being used to modify a noun phrase, which is the essential point in this section.
As shown in (30) and (31) below, while the prepositional phrases in (4) - (6) are capable of being modified by prepositional phrase modifiers, the putative prepositional phrases in (1) - (3) are not. This provides further evidence that the phrases in (1) - (3) are not in fact verb + prepositional phrase constructions, but rather multi-word verbs followed by noun phrases.

(30)  
   a. * The student looked right/straight/clear up the word.  
   b. * My roommate took right/straight/clear out the trash.  
   c. * The mailman picked right/straight/clear up the package.  

(31)  
   a. The dog looked right/straight/clear up the tree (at the cat who was sitting on a branch).  
   b. The joggers ran right/straight/clear under the bridge.  
   c. The cat hid right/?straight/?clear under the table.  

3.3.1.7 Prepositional Phrase Fronting

Prepositional phrases are also capable of appearing in sentence initial position, providing another test to distinguish between the two forms in question. As could be predicted by the evidence shown so far, only the prepositional phrases in (4) - (6) are capable of appearing in sentence initial position (33). Attempting to move the preposition and noun phrase from (1) - (3) 

\[\text{ii Although straight and clear produce sentences of questionable grammaticality in (27c), The cat hid right under the table is clearly acceptable, and all of the modified sentences in (27c) remain more acceptable than any of the sentences in (26).}\]
to sentence initial position results in ungrammatical sentences (32), providing further evidence that only the preposition + noun phrase constructions in (4) - (6) form prepositional phrase constituencies.

(32)  
   a. * Up the word, the student looked.  
   b. * Out the trash, my roommate took.  
   c. * Up the package, the mailman picked.

(33)  
   a. Up the tree, the dog looked.  
   b. Under the bridge, the joggers ran.  
   c. Under the table, the cat hid.

The data shown above clearly distinguishes a syntactic difference between the constructions in (1) - (3) on one hand, and those in (4) - (6) on the other. Not only do these tests provide evidence that the forms are different, they also provide clear direction for being able to categorize each of the forms as was previously done in (16) and (17) (repeated below).

(16) a. [looked up [ the word]]  
   b. [ took out [ the trash]]  
   c. [picked up [ the package]]

(17) a. [looked [ up [ the tree]]]  
   b. [ran [ under [ the bridge]]]  
   c. [hid [ under [ the table]]]
In particular, the behavior of the constructions in (1) - (3) with respect to passivization, pronominalization, substitution, and adverbial modification indicates that the noun phrases \( [_{NP} \text{ the word}] \), \( [_{NP} \text{ the trash}] \), and \( [_{NP} \text{ the package}] \) are direct object complements of the complex verbal constructions \( [_{VP} \text{ look up}] \), \( [_{VP} \text{ take out}] \), and \( [_{VP} \text{ pick up}] \), respectively.

Additionally, the behavior of the constructions in (4) - (6) with respect to \( \text{wh}\)-question formation, prepositional phrase modification, and prepositional phrase fronting clearly delimits these constructions as single-word verbs followed by prepositional phrase adjuncts, as outlined in (17).

### 3.3.2 Semantic Behavior of Phrasal Verbs

An examination of the semantic characteristics of phrasal verbs not only underlines the difference between phrasal verb constructions and verbs that take prepositional phrases but also reveals an important distinction between different kinds of phrasal verbs.

As can be seen in examples (34) and (35) below, while the prepositions that follow prepositional verbs do not change the meaning of the verbs they follow, phrasal verbs lose their meaning if the particle is removed.

(34) The man ran \textit{up a big hill}. (verb plus prepositional phrase adjunct)
(35) The man ran up a big bill. (phrasal verb with direct object)

In these examples, it is clear that the addition of the preposition up in (34) does not change the meaning of the verb run. In (35), however, the preposition up is an integral part of the phrasal verb run up, and completely changes the semantics of the verb run.

Clearly, the semantic behavior of phrasal verbs differentiates them from verbs that take prepositional phrases. Of more interest to this study, however, is the possibility of subdividing phrasal verbs into semantic categories. In particular, this study will deal with the two major subdivisions of phrasal verbs: metaphorical or idiomatic phrasal verbs and directional phrasal verbs.

As part of a more extensive examination of how verb-particle constructions are stored in long-term memory, Jackendoff (2002) outlined certain characteristics of these two major categories, as well as several other minor categories of phrasal verb that are not of interest to this study.

The first of these categories, the idiomatic or metaphorical phrasal verb constructions, includes such phrasal verbs as look up, blow up, throw up, and freak out, along with hundreds of other English phrasal verbs. This class of verbs is productive and, according to Jackendoff, is semantically noncompositional in nature. That is, there is nothing about the combination of the meaning of the verb and the meaning of the particle that leads logically to the meaning of the phrasal
verb (i.e, to look up does not mean to glance towards the sky; to throw up does not mean to project something at the sky, etc).

Directional phrasal verbs, on the other hand, do appear to have compositional meaning, as the particle in question retains its directional quality. Jackendoff claims that certain verbs, such as take and put, select a directional prepositional argument which can be replaced by a particle and followed by a direct object. Therefore, although the particle retains its intrinsic directional meaning, transitive forms of these constructions can appear in the two direct object forms mentioned previously (36), as also occurs with metaphorical phrasal verbs (37).

(36)  
a. Jack **took out** the garbage. / Jack **took** the garbage **out**.

b. Sally **put on** a hat. / Sally **put** a hat **on**.

(37)  
a. The construction crew **blew up** the building. / The construction crew **blew** the building **up**.

b. The sick child **threw up** his breakfast. / The sick child **threw** his breakfast **up**.

Jackendoff claims that because the constructions in (36) are compositional in nature, they do not form a single lexical entry as the metaphorical constructions in (37) must. It is this fact that allows some directional particles to appear in
locative inversion constructions (38a) and exclamatives (38b), while idiomatic particles cannot (39).

(38)  
  a. Out goes the garbage.
  b. On with your hat!

(39)  
  a. * Up goes the building.
  b. * Up with your lunch!

Therefore, although these two classes of phrasal verbs generally display similar syntactic behaviors, particularly in regard to the syntactic tests outlined in part 3.3.1 above, semantic distinctions do exist that allow these verbs to be broken into different classes.

3.4 RATIONALE FOR THE USE OF THE TARGET STRUCTURE

The current study was designed to take advantage of the syntactic and semantic behavior of phrasal verbs in order to closely examine processing and attention to form and meaning in learners of English as a second language. Phrasal verbs offer a unique and exciting opportunity to simultaneously examine form and function because they provide the variations that allow the researcher to use just one target form to examine several different conditions.

First of all, the fact that transitive phrasal verbs can appear in two (generally equally acceptable) structures (40) allows for the investigation of the
effects of syntactic alteration on attentional capacity and processability. In particular, examining whether there exists a difference in processing time and comprehension between verb/direct object chunks in both forms (40) provides an indication as to whether one of the possible forms requires more attention to process than the other.

(40)  

a. Susan threw away the piece of paper before she left class.

b. Susan threw the piece of paper away before she left class.

Further, the semantic complexity of phrasal verbs outlined by Jackendoff (2002) provides an opportunity to look at complexity of meaning with respect to phrasal verbs, and to determine whether, as posited by Celce-Murcia and Larsen-Freeman (1999), directional phrasal verbs are easier for learners of English, and therefore require less attention to process. As such, metaphorical and directional phrasal verb contrasts were used in the current study (41).

(41)  

a. Susan threw away the piece of paper before she left class.

(directional)

b. Susan tore up the piece of paper before she left class.

(metaphorical)
Most importantly, since phrasal verbs provide the opportunity to investigate both syntactic and semantic alterations, this construction allows the researcher to examine not only the difference between the sentences in (40) and (41), but also to compare how processing differences between sentences of various complexity of form compare to processing of sentences with various complexity in meaning (42). This fact provides a unique opportunity to weigh in on the argument of attention to form and meaning using one target form, an approach that exists nowhere in the current literature on attention to form and meaning. Further, the study will contribute to examinations of phrasal verbs by comparing the processing of the various forms in which phrasal verbs can occur.

(42) a. Susan tore up the piece of paper before she left class.

b. Susan tore the piece of paper up before she left class.

c. Susan threw away the piece of paper before she left class.

d. Susan threw the piece of paper away before she left class.

Finally, the fact that phrasal verbs can be separated by noun phrases of various weight (43), also allowed this study to manipulate the heaviness of noun phrase direct objects to examine whether the amount of separation between the
verb and the particle affected learners’ ability to process the construction (although no sentences of questionable grammaticality, like 15c, were used).

(43)  

a. The construction crew **blew up** the old building on Main Street last week.

b. The construction crew **blew** the old building on Main Street **up** last week.

c. The construction crew **took apart** the old building on Main Street last week.

d. The construction crew **took** the old building on Main Street **apart** last week.

3.5 MATERIALS

3.5.1 SENTENCE REPETITION TASK

The data needed to answer the first research question, repeated below, was gathered by use of a sentence repetition task.

RQ 1: Do syntactic and semantic complexity affect adult learners’ attention to variation in phrasal verb structure?

The sentence repetition task provided participants with a recording of one sentence at a time, which they then repeated into a microphone that recorded their response. The participants repeated a total of 36 sentences, each consisting
of eight words. Twenty-four of the sentences were token items and 12 were fillers. The token items were written in one of four conditions reflecting variations in syntactic and semantic complexity of phrasal verb constructions (44). Three different versions of the task were created, each containing the same 36 sentences in a different order.

(44)  

a. metaphorical verb in contiguous position

The boy figured out the correct answer.

b. metaphorical verb in separated position

Mr. White filled the job application out.

c. directional verb in contiguous position

The students put down their pencils.

d. directional verb in separated position

The little girl let her dog in.

The sentences for this task were recorded by a native speaker of English, which were then converted into a QuickTime movie. The video started with instructions for the task which were presented both orally, in the recording, and visually, on the computer screen. Subsequently, the sentences were played with a
pause between each sentence for the participants to repeat the sentence. As each sentence was played, only the number of the sentence appeared on the screen. Since it was important to prevent students from listening to a sentence more than once, the task was designed to run automatically, and participants were not permitted to touch the computer while the video played. In order to record the participants’ repetitions of the sentences, the program Audacity ran in the background as the video played.

3.5.2 Self-Paced Reading Task

The self-paced reading task was designed to provide the data necessary for answering the final two research questions. I will first describe how the task provided evidence for the second research question, repeated below.

RQ 2: To what extent do syntactic and semantic complexity affect:

(a) adult learners’ processing of written input?

(b) adult learners’ comprehension of written input?

This task utilized an internet-based program designed specifically for psycholinguistic study. The program, called Ibex, presents the reading data one word at a time via a noncumulative moving window display. Participants pressed the space bar to receive each subsequent word in the sentence, while the computer program recorded in milliseconds the time between each pressing of
the space bar. The reading times are then analyzed to identify constructions that
the participants have greater difficulty in processing.

The task consisted of 64 items, of which 32 were token sentences and 32
were filler sentences. Each of the token sentences was available in four conditions
to reflect the varying possibilities for syntactic and semantic complexity. An
example of a self-paced reading task sentence in each condition is seen in (45).

(45)  a. *metaphorical verb in contiguous position*

   The robot can figure out the puzzle in two minutes.

b. *metaphorical verb in separated position*

   The robot can figure the puzzle out in two minutes.

c. *directional verb in contiguous position*

   The robot can put together the puzzle in two minutes.

d. *directional verb in separated position*

   The robot can put the puzzle together in two minutes.

The Ibex software was programmed to choose one of the four conditions
for each item, as well as to randomly distribute the token and filler items. Filler
items were composed using the applicative construction, and were also available
in four different conditions, as seen in (46) below.
a. The boy passed the ball to his teammate.

b. The boy passed his teammate the ball.

c. The boy threw the ball to his teammate.

d. The boy threw his teammate the ball.

In order to determine comprehension of the written input based on syntactic and semantic complexity (Research Question 2b), 60% of the sentences were followed by true/false questions. Comprehension questions were presented as a complete sentence which appeared after the participant had finished reading the sentence on which the question was based. Participants pressed 1 to answer that the question was true and 2 to answer that it was false. Items containing comprehension questions were distributed randomly throughout the task.

The self-paced reading task was also used to gather evidence pertaining to the final research question, repeated below.

RQ 3: To what extent does direct object weight affect:

(a) adult learners’ processing of written input?

(b) adult learners’ comprehension of written input?

Half of the items in the task were written with weightier noun phrase direct objects in order to determine whether distance of separation between the
verb and the particle plays a role in processing times and in comprehension of input. In all cases, the heavy noun phrase consisted of an NP with a PP modifier. An example of a heavier direct object in each condition is seen in (47).

(47)  a. metaphorical verb in contiguous position

    The gardener will check out the tree in my backyard tomorrow afternoon.

b. metaphorical verb in separated position

    The gardener will check the tree in my backyard out tomorrow afternoon.

c. directional verb in contiguous position

    The gardener will cut down the tree in my backyard tomorrow afternoon.

d. directional verb in separated position

    The gardener will cut the tree in my backyard down tomorrow afternoon.

Processing and comprehension of these items was determined in the same manner as the non-heavy direct object items.
3.6 Procedure

Testing took place during regular class time over four days in a computer lab at an intensive English program for international students. Each student had access to an individual computer and a headset that included earphones and a microphone. Participants completed the sentence repetition activity first. As this activity was intrinsically time-restrictive, each student had eight minutes to listen to the sentences and record their responses. To make participants less likely to hear other students repeating the same sentences that they were in the process of repeating, the versions of the task that students completed (version 1, 2, and 3) were alternated throughout the computer lab.

After completing the sentence repetition task, participants were instructed to move on to the self-paced reading task. Participants were given as much time as they needed to complete this task; however, all participants were able to finish the task before the class period ended.

3.7 Pilot Study

Pilot testing of the instrument was conducted in March 2013, using eight participants. Trials of the instrument and feedback from participants yielded several adjustments to the design. Glitches in the website language used for the self-paced reading task that caused the website to report to participants that they
had answered a question incorrectly when in fact they had answered correctly were discovered and repaired. A few mistakes in the sentences themselves were fixed. Based on feedback from participants, additional comprehension questions were added in an attempt to keep participants on task rather than allowing them to skip quickly through the sentences. Pilot testing also brought to the researcher’s attention a potential problem with the website’s Latin square design; as a result, task start times were staggered for participants in order to ensure that conditions were fairly evenly distributed. Finally, the number of token and filler sentences were increased.
CHAPTER 4

RESULTS

In this chapter, I discuss the statistical procedures followed to obtain results from the data collected in the tasks, and I provide those results in detail.

4.1 ATTENTION TO STRUCTURAL VARIATION

The first task, the sentence repetition task, relates directly to the first research question, repeated below.

RQ 1: Do syntactic and semantic complexity affect adult learners’ attention to variation in phrasal verb structure?

The results in this section demonstrate how the syntactic and semantic variations in the aural input affected participants’ ability to correctly reproduce the sentences that they heard. This in turn is an indication of whether participants were successful in attending to the structure of the phrasal verb input.

4.1.1 PARTICIPANTS AND ELIMINATION PROCEDURES

While all of the participants (16 native speakers and 66 nonnative speakers) took part in the sentence repetition task, several participants were eliminated. Recording errors, both recordings that were not functional and those
that were impossible to hear, resulted in the elimination of two native speakers and five nonnative speakers (one level six student and four level five students). In addition, participants were eliminated for not attempting or mumbling through more than 40% of the token sentences. This resulted in the elimination of three nonnative speakers - two level five speakers and one level six speaker. After eliminations, the results provided in this section are based on data from the remaining fourteen native speakers and 58 nonnative speakers, consisting of 32 level five students and 26 level six students.

4.1.2 STATISTICAL PROCEDURES AND RESULTS

Of the two major effects considered in this study as a whole (condition and direct object length), only condition was a consideration for this research question. The four conditions under investigation are repeated in (1) below for ease of reference.

(1) Condition A. metaphorical verbs in contiguous position

   a. The robot can *figure out the puzzle* in two minutes.

Condition B. metaphorical verbs in shifted position

   b. The robot can *figure the puzzle out* in two minutes.

Condition C. non-metaphorical verbs in contiguous position

   c. The robot can *put together the puzzle* in two minutes.
Condition D. non-metaphorical verbs in shifted position

d. The robot can *put the puzzle together* in two minutes.

Raw sentence repetition accuracy scores are presented in Table 4.1. As would be expected, the native speaker group had the highest repetition accuracy, with only one missed repetition in each of conditions A, B and D, and no errors for condition C. The higher proficiency nonnative speakers had the second greatest overall accuracy at 76.72%, and the level 5 nonnative speakers were the least accurate in sentence repetition, at 67.12%. Further, it is clear that the nonnative speakers were less accurate in their repetitions of sentences that had the particles separated from the verb (condition B at 61.76% and condition D at 66.76%), and were the least accurate of all with the separated metaphorical verbs (condition B). In fact, condition B resulted in the least accurate sentence repetitions for both proficiency levels (58.70% for level 5 and 65.81% for level 6), although this condition did not have the same effect on native speakers, at 98.81% accuracy.

TABLE 4.1  SENTENCE REPETITION ACCURACY BY CONDITION

<table>
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<tr>
<th></th>
<th>metaphorical contiguous</th>
<th>metaphorical separated</th>
<th>directional contiguous</th>
<th>directional separated</th>
<th>TOTAL</th>
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</thead>
<tbody>
<tr>
<td>native speakers</td>
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<td>98.81%</td>
<td>100%</td>
<td>98.81%</td>
<td>99.11%</td>
</tr>
<tr>
<td>nonnative speakers</td>
<td>77.58%</td>
<td>61.76%</td>
<td>80%</td>
<td>66.76%</td>
<td>71.52%</td>
</tr>
<tr>
<td>level 5</td>
<td>71.20%</td>
<td>58.70%</td>
<td>75.54%</td>
<td>63.04%</td>
<td>67.12%</td>
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</table>
The statistical significance of the effect of condition on the accuracy of sentence repetitions was analyzed using a general association analysis with the Cochran-Mantel-Haenszel test to account for repeated measures. Table 4.2 below shows the numbers for accuracy by condition for the native speaker control group. In table 4.3, statistic 3 shows that there was no statistically significant relationship between sentence repetition accuracy and condition for native speakers (\(p=.4936\)).

**TABLE 4.2 FREQUENCY TABLE FOR ACCURACY BY CONDITION, NATIVE SPEAKERS**

<table>
<thead>
<tr>
<th>Frequency</th>
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<th>directional contiguous</th>
<th>directional separated</th>
<th>TOTAL</th>
</tr>
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<td>.89</td>
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<td>84</td>
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</tr>
</tbody>
</table>

**TABLE 4.3 STATISTICS FOR ACCURACY BY CONDITION, NATIVE SPEAKERS**

Summary Statistics for condition by response
Controlling for student

<table>
<thead>
<tr>
<th>Statistic</th>
<th>Alternative Hypothesis</th>
<th>DF</th>
<th>Value</th>
<th>Prob</th>
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</thead>
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<td>3</td>
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</table>

Tables 4.4 and 4.5 below show the frequencies and the statistics for sentence repetition by condition for the combined group of nonnative speakers. Unlike the native speaker group, repetition accuracy was dependent on condition for the nonnative speakers ($p=.0009$). In particular, nonnative speakers were more likely to incorrectly repeat a sentence in conditions B and D, that is, sentences in which the particle was separated from the verb by the direct object.
TABLE 4.4 FREQUENCY TABLE FOR ACCURACY BY CONDITION, NONNATIVE SPEAKERS

<table>
<thead>
<tr>
<th>Frequency</th>
<th>INCORRECT</th>
<th>CORRECT</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>metaphorical contiguous</td>
<td>metaphorical separated</td>
<td>directional contiguous</td>
</tr>
<tr>
<td>INCORRECT</td>
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<td>131</td>
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<td>5.66</td>
<td>9</td>
<td>5</td>
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<tr>
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<td></td>
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<td>25</td>
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</tr>
</tbody>
</table>

TABLE 4.5 STATISTICS FOR ACCURACY BY CONDITION, NONNATIVE SPEAKERS

Summary Statistics for condition by response
Controlling for student

<table>
<thead>
<tr>
<th>Statistic</th>
<th>Alternative Hypothesis</th>
<th>DF</th>
<th>Value</th>
<th>Prob</th>
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</thead>
<tbody>
<tr>
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<td>Nonzero Correlation</td>
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</tr>
<tr>
<td>2</td>
<td>Row Mean Scores Differ</td>
<td>3</td>
<td>32.8679</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>3</td>
<td>General Association</td>
<td>18</td>
<td>42.6007</td>
<td>*0.0009</td>
</tr>
</tbody>
</table>

* indicates a p-value of <.05
Tables 4.6 through 4.9 below show the frequencies and statistics for repetition accuracy separated by proficiency level.

**TABLE 4.6 FREQUENCY TABLE FOR ACCURACY BY CONDITION, LEVEL 5**

<table>
<thead>
<tr>
<th>Frequency</th>
<th>metaphorical contiguous</th>
<th>metaphorical separated</th>
<th>directional contiguous</th>
<th>directional separated</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>INCORRECT</td>
<td>53</td>
<td>76</td>
<td>45</td>
<td>68</td>
<td>242</td>
</tr>
<tr>
<td></td>
<td>7.20</td>
<td>10.33</td>
<td>6.11</td>
<td>9.24</td>
<td>32.88</td>
</tr>
<tr>
<td></td>
<td>21.90</td>
<td>31.40</td>
<td>18.60</td>
<td>28.10</td>
<td></td>
</tr>
<tr>
<td></td>
<td>28.80</td>
<td>41.30</td>
<td>24.46</td>
<td>36.96</td>
<td></td>
</tr>
<tr>
<td>CORRECT</td>
<td>131</td>
<td>108</td>
<td>139</td>
<td>116</td>
<td>494</td>
</tr>
<tr>
<td></td>
<td>17.80</td>
<td>14.67</td>
<td>18.89</td>
<td>15.76</td>
<td>67.12</td>
</tr>
<tr>
<td></td>
<td>26.52</td>
<td>21.86</td>
<td>28.14</td>
<td>23.48</td>
<td></td>
</tr>
<tr>
<td></td>
<td>71.20</td>
<td>58.70</td>
<td>75.54</td>
<td>63.04</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>184</td>
<td>184</td>
<td>184</td>
<td>184</td>
<td>736</td>
</tr>
<tr>
<td></td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>100</td>
</tr>
</tbody>
</table>

**TABLE 4.7 STATISTICS FOR ACCURACY BY CONDITION, LEVEL 5**

Summary Statistics for condition by response
Controlling for student

**Cochran-Mantel-Haenszel Statistics (Based on Table Scores)**

<table>
<thead>
<tr>
<th>Statistic</th>
<th>Alternative Hypothesis</th>
<th>DF</th>
<th>Value</th>
<th>Prob</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Nonzero Correlation</td>
<td>1</td>
<td>0.1145</td>
<td>0.7351</td>
</tr>
<tr>
<td>2</td>
<td>Row Mean Scores Differ</td>
<td>3</td>
<td>13.9695</td>
<td>*0.0029</td>
</tr>
</tbody>
</table>
Cochran-Mantel-Haenszel Statistics (Based on Table Scores)

<table>
<thead>
<tr>
<th>Statistic</th>
<th>Alternative Hypothesis</th>
<th>DF</th>
<th>Value</th>
<th>Prob</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>General Association</td>
<td>15</td>
<td>21.2643</td>
<td>0.1286</td>
</tr>
</tbody>
</table>

* indicates a $p$-value of <.05

While the level 6 students were overall much more accurate with their sentence repetitions than level 5 students (77.10% and 67.12%, respectively), general association tests for level 6 still showed a statistically significant result for the effect of condition on repetition accuracy ($p=0.0295$).

TABLE 4.8 FREQUENCY TABLE FOR ACCURACY BY CONDITION, LEVEL 6

<table>
<thead>
<tr>
<th></th>
<th>metaphorical contiguous</th>
<th>metaphorical separated</th>
<th>directional contiguous</th>
<th>directional separated</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INCORRECT</td>
<td>23</td>
<td>53</td>
<td>22</td>
<td>44</td>
<td>142</td>
</tr>
<tr>
<td>Percent</td>
<td>3.71</td>
<td>8.55</td>
<td>3.55</td>
<td>7.10</td>
<td>22.90</td>
</tr>
<tr>
<td>Row Pct</td>
<td>16.20</td>
<td>37.32</td>
<td>15.49</td>
<td>30.99</td>
<td></td>
</tr>
<tr>
<td>Col Pct</td>
<td>14.84</td>
<td>34.19</td>
<td>14.19</td>
<td>28.39</td>
<td></td>
</tr>
<tr>
<td>CORRECT</td>
<td>132</td>
<td>102</td>
<td>133</td>
<td>111</td>
<td>478</td>
</tr>
<tr>
<td>Percent</td>
<td>21.29</td>
<td>16.45</td>
<td>21.45</td>
<td>17.90</td>
<td>77.10</td>
</tr>
<tr>
<td>Row Pct</td>
<td>27.62</td>
<td>21.34</td>
<td>27.82</td>
<td>23.22</td>
<td></td>
</tr>
<tr>
<td>Col Pct</td>
<td>85.16</td>
<td>65.81</td>
<td>85.81</td>
<td>71.61</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>155</td>
<td>155</td>
<td>155</td>
<td>155</td>
<td>620</td>
</tr>
<tr>
<td></td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>100</td>
</tr>
</tbody>
</table>
TABLE 4.9 STATISTICS FOR ACCURACY BY CONDITION, LEVEL 6
Summary Statistics for condition by response
Controlling for student

<table>
<thead>
<tr>
<th>Statistic</th>
<th>Alternative Hypothesis</th>
<th>DF</th>
<th>Value</th>
<th>Prob</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Nonzero Correlation</td>
<td>1</td>
<td>1.4288</td>
<td>0.2320</td>
</tr>
<tr>
<td>2</td>
<td>Row Mean Scores Differ</td>
<td>3</td>
<td>20.0093</td>
<td>*0.0002</td>
</tr>
<tr>
<td>3</td>
<td>General Association</td>
<td>18</td>
<td>30.9068</td>
<td>*0.0295</td>
</tr>
</tbody>
</table>

* indicates a *p*-value of <.05

Nonnative speakers struggled in general with verbs separated from particles, as previously mentioned, and both groups showed the lowest accuracy with condition B (58.70% for level 5 and 65.81% for level 6), indicating that the metaphorical verbs in separated position were the most challenging for nonnative speakers.

The errors made by nonnative speaker participants in their oral responses in this task were broken into seven major descriptive categories, as seen in Table 4.10.

TABLE 4.10 CATEGORIZATION OF NONNATIVE SPEAKER ERRORS BY CONDITION

<table>
<thead>
<tr>
<th></th>
<th>metaphorical contiguous</th>
<th>metaphorical separated</th>
<th>directional contiguous</th>
<th>directional separated</th>
</tr>
</thead>
<tbody>
<tr>
<td>no response</td>
<td>10</td>
<td>23</td>
<td>16</td>
<td>28</td>
</tr>
<tr>
<td>Category</td>
<td>metaphorical contiguous</td>
<td>metaphorical separated</td>
<td>directional contiguous</td>
<td>directional separated</td>
</tr>
<tr>
<td>---------------------------</td>
<td>-------------------------</td>
<td>------------------------</td>
<td>------------------------</td>
<td>------------------------</td>
</tr>
<tr>
<td>unintelligible</td>
<td>25</td>
<td>33</td>
<td>36</td>
<td>31</td>
</tr>
<tr>
<td>no particle</td>
<td>42</td>
<td>34</td>
<td>7</td>
<td>19</td>
</tr>
<tr>
<td>wrong particle</td>
<td>3</td>
<td>4</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>moved particle</td>
<td>1</td>
<td>24</td>
<td>2</td>
<td>16</td>
</tr>
<tr>
<td>repeated particle</td>
<td>0</td>
<td>14</td>
<td>0</td>
<td>18</td>
</tr>
<tr>
<td>additional particle</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>0</td>
</tr>
</tbody>
</table>

If a participant did not attempt to repeat a sentence in the task, the lack of attempt was coded as “no response.” Responses that were mumbled or otherwise impossible to understand were categorized as “unintelligible.” Problematic responses that were determined to be the result of technical difficulties were removed from the results. Examples of actual participant responses corresponding to the remaining categories are listed in (2) below.

(2)  

a. *no particle*

“The boy figured the correct answer.”

*(original sentence: The boy figured out the correct answer.)*

“The girl put her yellow hat.”

*(original sentence: The girl put her yellow hat on.)*

b. *wrong particle*
“The teacher broke up the difficult problem.”

(Original sentence: The teacher broke down the difficult problem.)

“Jane tore the piece of paper up.”

(Original sentence: Jane tore the piece of paper out.)

c. moved particle

“The old man took his jacket off.”

(Original sentence: The old man took off his jacket.)

“Mr. White filled out the job application.”

(Original sentence: Mr. White filled the job application out.)

d. repeated particle

“The student picked up his blue pen up.”

(Original sentence: The student picked his blue pen up.)

“Mrs. Green cleaned up the dirty kitchen up.”

(Original sentence: Mrs. Green cleaned the dirty kitchen up.)

e. additional particle

“The little boy put together the puzzle up.”

(Original sentence: The little boy put the puzzle together.)

“The teacher broke down the difficult problem out.”

(Original sentence: The teacher broke down the difficult problem.)
The data shown in Table 4.10 point to several major patterns in the repetition errors of nonnative speakers. While the unintelligible responses and the responses which gave the wrong particle are fairly evenly distributed across the conditions, other responses pattern together in interesting ways.

Participants were more likely to not attempt a repetition of the sentence (“no response”) when the phrasal verb and particle were separated from each other by the direct object. The separated conditions, B and D, accounted for 66% of the “no response” category. An even more distinct pattern is apparent in the “no particle” category, in which 74.51% of responses that lacked a particle took place in conditions A and B, sentences which included a metaphorical verb. In responses in which the participant moved the particle from its position in the original sentence, a full 93.02% of responses moved the particle from the separated position to a contiguous position (conditions B and D). Only three errors were the result of moving a contiguous verb and particle construction to a separated position. Finally, while there were 32 examples of participants repeating a particle (as in (3d)), this only occurred when participants were attempting to repeat a sentence of condition B or D - those sentences in which the verb and particle were separated. While the addition of a particle that was not present in the original sentence occurred only with contiguous verbs, there were
only three instances of this occurring, and therefore no statistical analysis was performed on this pattern.

The tables (4.11-4.18) below show the statistics for these patterns in repetition errors. In order to determine whether the patterns were statistically significant, analyses were performed using McNemar’s test to assess the relationship between the conditions and the types of response. The statistics below show that all of the patterns described above were proven to be statistically significant.

TABLE 4.11 FREQUENCY OF NO RESPONSE BY PARTICLE PLACEMENT

<table>
<thead>
<tr>
<th>Frequency</th>
<th>SEPARATE</th>
<th>CONTIGUOUS</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO RESPONSE</td>
<td>51</td>
<td>26</td>
<td>77</td>
</tr>
<tr>
<td></td>
<td>12.03</td>
<td>6.13</td>
<td>18.16</td>
</tr>
<tr>
<td></td>
<td>66.23</td>
<td>33.77</td>
<td></td>
</tr>
<tr>
<td></td>
<td>24.06</td>
<td>12.26</td>
<td></td>
</tr>
<tr>
<td>RESPONSE</td>
<td>161</td>
<td>186</td>
<td>347</td>
</tr>
<tr>
<td></td>
<td>37.97</td>
<td>43.87</td>
<td>81.84</td>
</tr>
<tr>
<td></td>
<td>46.40</td>
<td>53.60</td>
<td></td>
</tr>
<tr>
<td></td>
<td>75.94</td>
<td>87.74</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>212</td>
<td>212</td>
<td>424</td>
</tr>
<tr>
<td></td>
<td>50</td>
<td>50</td>
<td>100</td>
</tr>
</tbody>
</table>

TABLE 4.12 STATISTICS FOR NO RESPONSE BY PARTICLE PLACEMENT

<table>
<thead>
<tr>
<th>Statistic</th>
<th>DF</th>
<th>Value</th>
<th>Prob</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chi-Square</td>
<td>1</td>
<td>9.9180</td>
<td>0.0016</td>
</tr>
</tbody>
</table>
Tables 4.11 and 4.12 show that participants were significantly more likely \((p<.0001)\) to fail to repeat a sentence if the phrasal verb in the sentence was separated by the direct object.

**TABLE 4.13 FREQUENCY OF NO PARTICLE BY VERB TYPE**
<table>
<thead>
<tr>
<th></th>
<th>METAPHORICAL</th>
<th>DIRECTIONAL</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>PARTICLE</td>
<td>136 32.08</td>
<td>186 43.87</td>
<td>322 75.94</td>
</tr>
<tr>
<td></td>
<td>42.24 57.76</td>
<td>87.74</td>
<td></td>
</tr>
<tr>
<td></td>
<td>64.15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>212 50</td>
<td>212 50</td>
<td>424 100</td>
</tr>
</tbody>
</table>

**TABLE 4.14. STATISTICS FOR NO PARTICLE BY VERB TYPE**

<table>
<thead>
<tr>
<th>Statistic</th>
<th>DF</th>
<th>Value</th>
<th>Prob</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chi-Square</td>
<td>1</td>
<td>32.2738</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Likelihood Ratio Chi-Square</td>
<td>1</td>
<td>33.3955</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Continuity Adj. Chi-Square</td>
<td>1</td>
<td>30.9957</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Mantel-Haenszel Chi-Square</td>
<td>1</td>
<td>32.1977</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Phi Coefficient</td>
<td></td>
<td>0.2759</td>
<td></td>
</tr>
<tr>
<td>Contingency Coefficient</td>
<td></td>
<td>0.2660</td>
<td></td>
</tr>
<tr>
<td>Cramer's V</td>
<td></td>
<td>0.2759</td>
<td></td>
</tr>
</tbody>
</table>

**McNemar's Test**

<table>
<thead>
<tr>
<th>Statistic (S)</th>
<th>74.6914</th>
</tr>
</thead>
<tbody>
<tr>
<td>DF</td>
<td>1</td>
</tr>
<tr>
<td>Asymptotic Pr &gt; S</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Exact Pr &gt;= S</td>
<td>*3.510E-19</td>
</tr>
</tbody>
</table>

* indicates a p-value of <.05
There was also a significant pattern for participants dropping the particle of the phrasal verb; if the phrasal verb in question was metaphorical in nature, participants were less likely to successfully repeat the particle \((p < .0001)\).

**TABLE 4.15 FREQUENCY OF MOVED PARTICLE BY PARTICLE PLACEMENT**

<table>
<thead>
<tr>
<th>Frequency Percent</th>
<th>MOVED PARTICLE</th>
<th>SEPARATE</th>
<th>CONTIGUOUS</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>40</td>
<td>3</td>
<td>43</td>
</tr>
<tr>
<td>Percent Row Pct</td>
<td>9.43</td>
<td>0.71</td>
<td>0.71</td>
<td>10.14</td>
</tr>
<tr>
<td>Percent Col Pct</td>
<td>93.02</td>
<td>6.98</td>
<td>6.98</td>
<td></td>
</tr>
<tr>
<td></td>
<td>18.87</td>
<td>1.42</td>
<td>1.42</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>NO MOVED PARTICLE</td>
<td>172</td>
<td>209</td>
<td>381</td>
</tr>
<tr>
<td>Percent Row Pct</td>
<td>40.57</td>
<td>49.29</td>
<td>49.29</td>
<td>89.86</td>
</tr>
<tr>
<td>Percent Col Pct</td>
<td>45.14</td>
<td>54.86</td>
<td>54.86</td>
<td></td>
</tr>
<tr>
<td></td>
<td>81.13</td>
<td>98.58</td>
<td>98.58</td>
<td></td>
</tr>
</tbody>
</table>

**TABLE 4.16 STATISTICS FOR MOVED PARTICLE BY PARTICLE PLACEMENT**

<table>
<thead>
<tr>
<th>Statistic</th>
<th>DF</th>
<th>Value</th>
<th>Prob</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chi-Square</td>
<td>1</td>
<td>35.4304</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Likelihood Ratio Chi-Square</td>
<td>1</td>
<td>41.4483</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Continuity Adj. Chi-Square</td>
<td>1</td>
<td>33.5411</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Mantel-Haenszel Chi-Square</td>
<td>1</td>
<td>35.3468</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Phi Coefficient</td>
<td></td>
<td>0.2891</td>
<td></td>
</tr>
<tr>
<td>Contingency Coefficient</td>
<td></td>
<td>0.2777</td>
<td></td>
</tr>
</tbody>
</table>
Tables 4.15 and 4.16 show that nonnative speakers were statistically more likely \((p<.0001)\) to move a particle from its original position if the original sentence included a particle that was separated from the verb by the direct object.

**TABLE 4.17 FREQUENCY OF REPEATED PARTICLE BY PARTICLE PLACEMENT**

<table>
<thead>
<tr>
<th>Frequency</th>
<th>SEPARATE</th>
<th>CONTIGUOUS</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percent</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Row Pct</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Col Pct</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Frequency Percent</th>
<th>REPEATED PARTICLE</th>
<th>NO REPEATED PARTICLE</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>32</td>
<td>180</td>
<td>392</td>
</tr>
<tr>
<td>Percent</td>
<td>7.55</td>
<td>42.45</td>
<td>92.45</td>
</tr>
<tr>
<td>Row Pct</td>
<td>100</td>
<td>45.92</td>
<td>84.91</td>
</tr>
<tr>
<td>Col Pct</td>
<td>15.09</td>
<td>84.91</td>
<td>15.09</td>
</tr>
</tbody>
</table>

* indicates a \(p\)-value of <.05
TABLE 4.18 STATISTICS FOR REPEATED PARTICLE BY PARTICLE PLACEMENT

<table>
<thead>
<tr>
<th>Statistic</th>
<th>DF</th>
<th>Value</th>
<th>Prob</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chi-Square</td>
<td>1</td>
<td>34.6122</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Likelihood Ratio Chi-Square</td>
<td>1</td>
<td>46.9766</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Continuity Adj. Chi-Square</td>
<td>1</td>
<td>32.4828</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Mantel-Haenszel Chi-Square</td>
<td>1</td>
<td>34.5306</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Phi Coefficient</td>
<td></td>
<td>0.2857</td>
<td></td>
</tr>
<tr>
<td>Contingency Coefficient</td>
<td></td>
<td>0.2747</td>
<td></td>
</tr>
<tr>
<td>Cramer's V</td>
<td></td>
<td>0.2857</td>
<td></td>
</tr>
</tbody>
</table>

| McNemar's Test                  |    |        |         |
| Statistic (S)                   | 180.0000|     |         |
| DF                              | 1  |        |         |
| Asymptotic Pr > S              | <.0001|     |         |
| Exact Pr >= S                  | *1.305E-54|    |         |

* indicates a p-value of <.05

Similarly, Tables 4.17 and 4.18 show that participants were more likely (p<.0001) to repeat a particle if the original sentence contained a verb in which the phrasal verb was separated by use of the direct object.

These statistics indicate that the categories of “no response”, “moved particle” and “repeated particle” were dependent on particle placement; these responses were more likely to occur when the elements of the phrasal verb were
separated. Likewise, participants were statistically more likely to omit the particle in their repetition of the sentence when the verb to be repeated was metaphorical rather than directional.

4.2 PROCESSING TIME AND COMPREHENSION OF WRITTEN INPUT

The self-paced reading task was designed to answer the remaining research questions by testing processing and comprehension not only for sentence condition but also for direct object length. These questions are repeated below.

RQ 2: To what extent do syntactic and semantic complexity affect:

(a) adult learners’ processing of written input?
(b) adult learners’ comprehension of written input?

RQ 3: To what extent does direct object weight affect:

(a) adult learners’ processing of written input?
(b) adult learners’ comprehension of written input?

In this section, I will first explain the elimination procedures that were involved in determining the participants whose data would be included in the results for this task. In 4.2.2, I detail the statistical procedures and results used to examine participants’ reading times, which will constitute the evidence for the processing questions concerning both sentence condition (Research Question 2a)
and direct object length (Research Question 3a). Section 4.2.3 gives the procedures and results for the comprehension data, which will be used to answer the Research Questions concerning comprehension of input (Research Questions 2b and 3b).

4.2.1 PARTICIPANTS AND ELIMINATION PROCEDURES

Sixteen native speakers and 66 nonnative speakers participated in the self-paced reading task. Thirty-eight of the nonnative speakers were students in level five, and 28 were level six students. Participants were included in the results based on two criteria: evidence of reading having taken place and percentage of correct responses to the comprehension questions.

Any participant who consistently showed reading times of fewer than 200 milliseconds per word was determined to have simply held down the button to proceed to the next word without reading each word. Three nonnative speaker participants were eliminated based on this criterion. Participants were also eliminated from this task for missing more than 60% of the comprehension questions. Six nonnative speakers were excluded from the results based on this criterion. No native speakers were eliminated for this task. As a result of eliminations, 57 nonnative speakers (31 level five and 26 level six) and 16 native speakers were included in the results for the self-paced reading task.
4.2.2 Statistical Procedures and Results, Reading Times

For this task, there were several factors to consider. The main factor that was being investigated was the effect of the different sentence conditions (as seen above in (1)) on reading time. However, there were also issues of sentence length, spillover effect, and proficiency level that needed to be investigated.

The raw average processing times for each of the factors mentioned above are included in tables 4.19-4.22 below. The mean times reflect the average reading time per word from the verb + direct object chunk (the italicized sections in (1), repeated in (3) below). The spillover mean times include the word following each verb + direct object chunk. This time has been included because it has been suggested that processing difficulties with a particular item in self-paced reading tasks are sometimes delayed until the word following that item is read. The length condition reflects mean reading times of heavier direct objects, as seen in (4).

(3) a. The robot can figure out the puzzle in two minutes.

b. The robot can figure the puzzle out in two minutes.

c. The robot can put together the puzzle in two minutes.

d. The robot can put the puzzle together in two minutes.

(4) a. The gardener will check out the tree in my backyard tomorrow afternoon.
b. The gardener will *check the tree in my backyard out* tomorrow afternoon.

c. The gardener will *cut down the tree in my backyard* tomorrow afternoon.

d. The gardener will *cut the tree in my backyard down* tomorrow afternoon.

**TABLE 4.19 RAW READING TIMES, NATIVE SPEAKERS**

<table>
<thead>
<tr>
<th></th>
<th>metaphorical contiguous</th>
<th>metaphorical separated</th>
<th>directional contiguous</th>
<th>directional separated</th>
</tr>
</thead>
<tbody>
<tr>
<td>mean</td>
<td>416.36</td>
<td>436.03</td>
<td>423.68</td>
<td>440.85</td>
</tr>
<tr>
<td>mean with spillover</td>
<td>416.24</td>
<td>432.41</td>
<td>435.65</td>
<td>437.60</td>
</tr>
<tr>
<td>heavy direct object</td>
<td>414.14</td>
<td>464.85</td>
<td>437.42</td>
<td>432.47</td>
</tr>
<tr>
<td>non-heavy direct object</td>
<td>418.12</td>
<td>416.04</td>
<td>417.43</td>
<td>444.80</td>
</tr>
</tbody>
</table>

**TABLE 4.20 RAW READING TIMES, NONNATIVE SPEAKERS**

<table>
<thead>
<tr>
<th></th>
<th>metaphorical contiguous</th>
<th>metaphorical separated</th>
<th>directional contiguous</th>
<th>directional separated</th>
</tr>
</thead>
<tbody>
<tr>
<td>mean</td>
<td>713.74</td>
<td>711.74</td>
<td>678.98</td>
<td>735.05</td>
</tr>
</tbody>
</table>
As is clear from the raw reading scores, the native speakers read more quickly than the nonnative speakers. Tables 4.21 and 4.22 below show that the higher proficiency group (level 6) read more quickly than the lower proficiency group (level 5).

**TABLE 4.21 RAW READING TIMES, NONNATIVE SPEAKERS LEVEL 5**

<table>
<thead>
<tr>
<th></th>
<th>metaphorical contiguous</th>
<th>metaphorical separated</th>
<th>directional contiguous</th>
<th>directional separated</th>
</tr>
</thead>
<tbody>
<tr>
<td>mean with spillover</td>
<td>696.04</td>
<td>702.98</td>
<td>673.04</td>
<td>715.50</td>
</tr>
<tr>
<td>heavy direct object</td>
<td>722.31</td>
<td>706.27</td>
<td>655.86</td>
<td>670.05</td>
</tr>
<tr>
<td>non-heavy direct object</td>
<td>708.73</td>
<td>717.19</td>
<td>692.90</td>
<td>756.72</td>
</tr>
</tbody>
</table>
TABLE 4.22 RAW READING TIMES, NONNATIVE SPEAKERS LEVEL 6

<table>
<thead>
<tr>
<th></th>
<th>metaphorical contiguous</th>
<th>metaphorical separated</th>
<th>directional contiguous</th>
<th>directional separated</th>
</tr>
</thead>
<tbody>
<tr>
<td>mean</td>
<td>667.00</td>
<td>657.39</td>
<td>645.50</td>
<td>683.66</td>
</tr>
<tr>
<td>mean with spillover</td>
<td>654.58</td>
<td>651.87</td>
<td>637.07</td>
<td>678.39</td>
</tr>
<tr>
<td>heavy direct object</td>
<td>657.85</td>
<td>667.86</td>
<td>633.91</td>
<td>638.73</td>
</tr>
<tr>
<td>non-heavy direct object</td>
<td>672.23</td>
<td>647.32</td>
<td>652.50</td>
<td>698.63</td>
</tr>
</tbody>
</table>

Spillover did not have a significant effect on mean reading time and was therefore not included in the statistical analysis below.

In order to determine whether the differences between the reading times for each condition and for direct object length were statistically significant, the statistics software SAS was used to perform a repeated measures mixed model procedure for statistical analysis.

In Tables 4.23 and 4.24 below, the statistical analysis for the reading times of native speakers is shown. The $p$-value column in table 4.23 shows that none of the fixed effects, neither any of the conditions nor the length of the direct objects, had a significant effect on reading times for native speakers. The ANOVA
procedure in table 4.24 shows the differences between the conditions and indicates that there were no significant differences between reading times for any of the conditions.

TABLE 4.23 SOLUTION FOR FIXED EFFECTS, NATIVE SPEAKERS

<table>
<thead>
<tr>
<th>Solution for Fixed Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effect</td>
</tr>
<tr>
<td>-------</td>
</tr>
<tr>
<td>Intercept</td>
</tr>
<tr>
<td>condition</td>
</tr>
<tr>
<td>condition</td>
</tr>
<tr>
<td>condition</td>
</tr>
<tr>
<td>condition</td>
</tr>
<tr>
<td>length</td>
</tr>
<tr>
<td>length</td>
</tr>
</tbody>
</table>

A - metaphorical contiguous  B - metaphorical separated  
C - directional contiguous  D - directional separated

TABLE 4.24 DIFFERENCES BETWEEN CONDITIONS, NATIVE SPEAKERS

<table>
<thead>
<tr>
<th>Differences of Least Squares Means</th>
</tr>
</thead>
<tbody>
<tr>
<td>condition</td>
</tr>
<tr>
<td>----------</td>
</tr>
<tr>
<td>A</td>
</tr>
</tbody>
</table>
The statistical analysis of the reading times for nonnative speakers (levels five and six combined) are shown in tables 4.25 and 4.26. Table 4.25 shows that while length did not have a significant effect on mean reading times, condition did. In particular, reading times for condition C show a statistically significant difference from condition D, used in this test as the reference point ($p=.0094$). This difference is spelled out in table 4.26, in which it can be seen that there is a significant difference ($p=.0460$, adjusted for multiple testing using the Tukey-Kramer method) between reading times for condition C and condition D. That is, reading times for the directional verbs presented contiguously were significantly faster than reading times for the directional verbs presented separately.
TABLE 4.25 SOLUTION FOR FIXED EFFECTS, NONNATIVE SPEAKERS

<table>
<thead>
<tr>
<th>Effect</th>
<th>condition</th>
<th>length</th>
<th>Estimate</th>
<th>Standard Error</th>
<th>DF</th>
<th>t Value</th>
<th>Pr &gt;</th>
<th>t</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td></td>
<td></td>
<td>716.86</td>
<td>33.2935</td>
<td>56</td>
<td>21.53</td>
<td>&lt;.0001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>condition A</td>
<td></td>
<td></td>
<td>-18.7864</td>
<td>20.2448</td>
<td>168</td>
<td>-0.93</td>
<td>0.3548</td>
<td></td>
<td></td>
</tr>
<tr>
<td>condition B</td>
<td></td>
<td></td>
<td>-18.1021</td>
<td>20.5410</td>
<td>168</td>
<td>-0.88</td>
<td>0.3794</td>
<td></td>
<td></td>
</tr>
<tr>
<td>condition C</td>
<td></td>
<td></td>
<td>-53.2984</td>
<td>20.2868</td>
<td>168</td>
<td>-2.63</td>
<td>*0.0094</td>
<td></td>
<td></td>
</tr>
<tr>
<td>condition D</td>
<td></td>
<td></td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>length 0</td>
<td></td>
<td></td>
<td>24.8364</td>
<td>15.0106</td>
<td>56</td>
<td>1.65</td>
<td>0.1036</td>
<td></td>
<td></td>
</tr>
<tr>
<td>length 1</td>
<td></td>
<td></td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

A - metaphorical contiguous
B - metaphorical separated
C - directional contiguous
D - directional separated

* indicates a p-value of <.05

TABLE 4.26 DIFFERENCES BETWEEN CONDITIONS, NONNATIVE SPEAKERS

| condition | condition | Estimate | Standard Error | DF  | t Value | Pr > |t| | Adj P |
|-----------|-----------|----------|----------------|-----|---------|------|--|------|
| A         | B         | -0.6843  | 20.2721        | 168 | -0.03   | 0.9731 | 1.0000 |
| A         | C         | 34.5120  | 20.1802        | 168 | 1.71    | 0.0891 | 0.3216 |
| A         | D         | -18.7864 | 20.2448        | 168 | -0.93   | 0.3548 | 0.7899 |
| B         | C         | 35.1963  | 20.2946        | 168 | 1.73    | 0.0847 | 0.3093 |

92
Differences of Least Squares Means

<table>
<thead>
<tr>
<th>condition</th>
<th>condition</th>
<th>Estimate</th>
<th>Standard Error</th>
<th>DF</th>
<th>t Value</th>
<th>Pr &gt;</th>
<th>t</th>
<th></th>
<th>Adj P</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>D</td>
<td>-18.1021</td>
<td>20.5410</td>
<td>168</td>
<td>-0.88</td>
<td>0.3794</td>
<td>0.8146</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>D</td>
<td>-53.2984</td>
<td>20.2868</td>
<td>168</td>
<td>-2.63</td>
<td>0.0094</td>
<td>*0.0460</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

A - metaphorical contiguous  B - metaphorical separated  
C - directional contiguous  D - directional separated

* indicates a p-value of <.05

In Tables 4.27-4.30, I have presented the nonnative speaker reading time analyses separately for the different proficiency levels. Table 4.27 shows that the trend presented in Table 4.25 for the nonnative speaker group as a whole holds for proficiency level five alone as well. Direct object length did not have a significant effect on mean reading time. Table 4.28 shows that although condition C was read faster than the other conditions, there was not a statistically significant difference (after the Tukey-Kramer adjustment) between condition C and the other conditions individually, unlike that which was seen for the nonnative speaker group.

**TABLE 4.27 SOLUTION FOR FIXED EFFECTS, NONNATIVE SPEAKERS LEVEL 5**

| Effect | condition | length | Estimate | Standard Error | DF | t Value | Pr > |t| |
|--------|-----------|--------|----------|----------------|----|---------|------|----|
| Intercept |          |        | 753.77   | 49.4690       | 30 | 15.24   | <.0001|
### Solution for Fixed Effects

<table>
<thead>
<tr>
<th>Effect</th>
<th>condition</th>
<th>length</th>
<th>Estimate</th>
<th>Standard Error</th>
<th>DF</th>
<th>t Value</th>
<th>Pr &gt;</th>
<th>t</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>condition</td>
<td>A</td>
<td>-20.7156</td>
<td>30.9165</td>
<td>90</td>
<td>-0.67</td>
<td>0.5045</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>condition</td>
<td>B</td>
<td>-13.9771</td>
<td>31.4006</td>
<td>90</td>
<td>-0.45</td>
<td>0.6573</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>condition</td>
<td>C</td>
<td>-68.6475</td>
<td>30.9499</td>
<td>90</td>
<td>-2.22</td>
<td>*0.0291</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>condition</td>
<td>D</td>
<td>0</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>length</td>
<td>0</td>
<td>33.5916</td>
<td>22.9030</td>
<td>30</td>
<td>1.47</td>
<td>0.1529</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>length</td>
<td>1</td>
<td>0</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

A - metaphorical contiguous  B - metaphorical separated  
C - directional contiguous  D - directional separated  
* indicates a p-value of <.05

### TABLE 4.28 DIFFERENCE BETWEEN CONDITIONS, NONNATIVE SPEAKERS  
LEVEL 5

#### Differences of Least Squares Means

<table>
<thead>
<tr>
<th>condition</th>
<th>condition</th>
<th>Estimate</th>
<th>Standard Error</th>
<th>DF</th>
<th>t Value</th>
<th>Pr &gt;</th>
<th>t</th>
<th></th>
<th>Adj P</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>B</td>
<td>-6.7384</td>
<td>30.9708</td>
<td>90</td>
<td>-0.22</td>
<td>0.8283</td>
<td></td>
<td>0.9963</td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>C</td>
<td>47.9319</td>
<td>30.7926</td>
<td>90</td>
<td>1.56</td>
<td>0.1231</td>
<td></td>
<td>0.4085</td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>D</td>
<td>-20.7156</td>
<td>30.9165</td>
<td>90</td>
<td>-0.67</td>
<td>0.5045</td>
<td></td>
<td>0.9081</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>C</td>
<td>54.6704</td>
<td>30.9953</td>
<td>90</td>
<td>1.76</td>
<td>0.0812</td>
<td></td>
<td>0.2975</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>D</td>
<td>-13.9771</td>
<td>31.4006</td>
<td>90</td>
<td>-0.45</td>
<td>0.6573</td>
<td></td>
<td>0.9704</td>
<td></td>
</tr>
</tbody>
</table>
Differences of Least Squares Means

<table>
<thead>
<tr>
<th>condition</th>
<th>condition</th>
<th>Estimate</th>
<th>Standard Error</th>
<th>DF</th>
<th>t Value</th>
<th>Pr &gt;</th>
<th>t</th>
<th></th>
<th>Adj P</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>D</td>
<td>-68.6475</td>
<td>30.9499</td>
<td>90</td>
<td>-2.22</td>
<td>0.0291</td>
<td>0.1262</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

A - metaphorical contiguous  B - metaphorical separated
C - directional contiguous  D - directional separated

Tables 4.29 and 4.30 below show the statistical analysis for level six nonnative speakers. Unlike the nonnative group as a whole, there were no statistically significant differences in the means for any of the fixed effects. Neither condition nor length played a significant role in affecting reading time for level six nonnative speakers.

TABLE 4.29 SOLUTION FOR FIXED EFFECTS, NONNATIVE SPEAKERS LEVEL 6

<table>
<thead>
<tr>
<th>Effect</th>
<th>condition</th>
<th>length</th>
<th>Estimate</th>
<th>Standard Error</th>
<th>DF</th>
<th>t Value</th>
<th>Pr &gt;</th>
<th>t</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td></td>
<td></td>
<td>672.67</td>
<td>41.9558</td>
<td>25</td>
<td>16.03</td>
<td>&lt;.0001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>condition</td>
<td>A</td>
<td></td>
<td>-16.3662</td>
<td>24.7795</td>
<td>75</td>
<td>-0.66</td>
<td>0.5110</td>
<td></td>
<td></td>
</tr>
<tr>
<td>condition</td>
<td>B</td>
<td></td>
<td>-22.7460</td>
<td>25.1120</td>
<td>75</td>
<td>-0.91</td>
<td>0.3680</td>
<td></td>
<td></td>
</tr>
<tr>
<td>condition</td>
<td>C</td>
<td></td>
<td>-34.9229</td>
<td>24.8599</td>
<td>75</td>
<td>-1.40</td>
<td>0.1642</td>
<td></td>
<td></td>
</tr>
<tr>
<td>condition</td>
<td>D</td>
<td></td>
<td>0</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>length</td>
<td>0</td>
<td></td>
<td>14.6478</td>
<td>18.3929</td>
<td>25</td>
<td>0.80</td>
<td>0.4333</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Solution for Fixed Effects

| Effect | condition | length | Estimate | Standard Error | DF | t Value | Pr > |t| |
|--------|-----------|--------|----------|----------------|----|---------|------|---|
| length |           | 1      | 0        | .              | .  | .       | .    | .|

A - metaphorical contiguous
B - metaphorical separated
C - directional contiguous
D - directional separated

**TABLE 4.30 DIFFERENCES BETWEEN CONDITIONS, NONNATIVE SPEAKERS LEVEL 6**

### Differences of Least Squares Means

<table>
<thead>
<tr>
<th>condition</th>
<th>condition</th>
<th>Estimate</th>
<th>Standard Error</th>
<th>DF</th>
<th>t Value</th>
<th>Pr &gt;</th>
<th>t</th>
<th></th>
<th>Adj P</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>B</td>
<td>6.3797</td>
<td>24.8006</td>
<td>75</td>
<td>0.26</td>
<td>0.7977</td>
<td>0.9940</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>C</td>
<td>18.5567</td>
<td>24.7245</td>
<td>75</td>
<td>0.75</td>
<td>0.4553</td>
<td>0.8762</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>D</td>
<td>-16.3662</td>
<td>24.7795</td>
<td>75</td>
<td>-0.66</td>
<td>0.5110</td>
<td>0.9115</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>C</td>
<td>12.1770</td>
<td>24.8386</td>
<td>75</td>
<td>0.49</td>
<td>0.6254</td>
<td>0.9610</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>D</td>
<td>-22.7460</td>
<td>25.1120</td>
<td>75</td>
<td>-0.91</td>
<td>0.3680</td>
<td>0.8018</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>D</td>
<td>-34.9229</td>
<td>24.8599</td>
<td>75</td>
<td>-1.40</td>
<td>0.1642</td>
<td>0.5004</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

A - metaphorical contiguous
B - metaphorical separated
C - directional contiguous
D - directional separated

4.2.3 **STATISTICAL PROCEDURES AND RESULTS, COMPREHENSION QUESTIONS**

In addition to providing data on reading times, the self-paced reading task included true/false questions designed to provide comprehension data for each
condition and for direct object length. Table 4.31 below provides the accuracy
scores for each group by condition and by direct object length.

**TABLE 4.31 COMPREHENSION QUESTION ACCURACY BY CONDITION AND DIRECT OBJECT LENGTH**

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>HEAVY</th>
<th>NON HEAVY</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>native</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>speakers</td>
<td>87.14%</td>
<td>95.31%</td>
<td>92.5%</td>
<td>98.82%</td>
<td>90.62%</td>
<td>95.07%</td>
<td>93.65%</td>
</tr>
<tr>
<td>nonnative</td>
<td>81.63%</td>
<td>70.93%</td>
<td>79.91%</td>
<td>83.92%</td>
<td>76.02%</td>
<td>81.46%</td>
<td>79.81%</td>
</tr>
<tr>
<td>level 5</td>
<td>77.28%</td>
<td>70.73%</td>
<td>78.4%</td>
<td>81.72%</td>
<td>73.79%</td>
<td>79.30%</td>
<td>77.55%</td>
</tr>
<tr>
<td>level 6</td>
<td>86.82%</td>
<td>71.15%</td>
<td>81.73%</td>
<td>86.54%</td>
<td>78.71%</td>
<td>73.39%</td>
<td>82.35%</td>
</tr>
</tbody>
</table>

A - metaphorical contiguous  
B - metaphorical separated  
C - directional contiguous  
D - directional separated

As would be expected, the native speakers produced the highest
comprehension accuracy scores at 93.65%, followed by the level 6 nonnative
speakers (82.35%) and the level 5 nonnative speakers (77.55%).

A logistic regression using condition D and heavy direct object length as
reference points was performed in order to determine whether response accuracy
was dependent on any of the sentence conditions or on direct object length. Table
4.32 below gives the results for this test on the nonnative speaker participant
group. While direct object length did not have a statistically significant effect on
response accuracy for nonnative speakers \( (p=.2812) \), response accuracy was dependent on condition. In particular, nonnative speaker participants were more likely to have answered the comprehension questions incorrectly \( (p=.0007) \) when the sentence preceding the question was a condition B sentence (a metaphorical verb separated by the direct object).

TABLE 4.32 LOGISTIC REGRESSION OF ACCURACY BY CONDITION AND DIRECT OBJECT LENGTH, NONNATIVE SPEAKERS

| Parameter | Estimate | Standard Error | 95% Confidence Limits | Z | Pr > |Z| |
|-----------|----------|----------------|-----------------------|---|-------|---|
| Intercept | 1.4834   | 0.2340         | 1.0247                | 1.9420 | 6.34 | <.0001 |
| condition A | -0.1119 | 0.2299 | -0.5625 | 0.3387 | -0.49 | 0.6264 |
| condition B | -0.6921 | 0.2034 | -1.0908 | -0.2935 | -3.40 | *0.0007 |
| condition C | -0.2528 | 0.2127 | -0.6697 | 0.1640 | -1.19 | 0.2346 |
| condition D | 0.0000 | 0.0000 | 0.0000 | 0.0000 | . | . |
| length 0 | 0.2053 | 0.1906 | -0.1682 | 0.5789 | 1.08 | 0.2812 |
| length 1 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | . | . |

A - metaphorical contiguous B - metaphorical separated
C - directional contiguous D - directional separated

* indicates a \( p \)-value of <.05
Tables 4.33 and 4.34 separate the nonnative speaker group by proficiency level.

The logistic regressions for the two proficiency levels indicate that the statistical effects shown for the entire nonnative group in table 4.32 are also significant for the groups separately ($p=.0398$ for level five and $p=.0052$ for level six). Neither group showed significant effects for direct object length ($p=.4292$ and $p=.4706$, respectively).

**TABLE 4.33 LOGISTIC REGRESSION OF ACCURACY BY CONDITION AND DIRECT OBJECT LENGTH, LEVEL 5**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Estimate</th>
<th>Standard Error</th>
<th>95% Confidence Limits</th>
<th>Z</th>
<th>Pr &gt;</th>
<th>Z</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>1.3315</td>
<td>0.2885</td>
<td>0.7661</td>
<td>1.8968</td>
<td>4.62</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>condition A</td>
<td>-0.2241</td>
<td>0.2764</td>
<td>-0.7657</td>
<td>0.3176</td>
<td>-0.81</td>
<td>0.4174</td>
</tr>
<tr>
<td>condition B</td>
<td>-0.5483</td>
<td>0.2667</td>
<td>-1.0711</td>
<td>-0.0255</td>
<td>-2.06</td>
<td>*0.0398</td>
</tr>
<tr>
<td>condition C</td>
<td>-0.1899</td>
<td>0.3176</td>
<td>-0.8123</td>
<td>0.4325</td>
<td>-0.60</td>
<td>0.5498</td>
</tr>
<tr>
<td>condition D</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>length 0</td>
<td>0.2017</td>
<td>0.2551</td>
<td>-0.2984</td>
<td>0.7018</td>
<td>0.79</td>
<td>0.4292</td>
</tr>
<tr>
<td>length 1</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

A - metaphorical contiguous  B - metaphorical separated
C - directional contiguous  D - directional separated

* indicates a $p$-value of <.05
### TABLE 4.34 LOGISTIC REGRESSION OF ACCURACY BY CONDITION AND DIRECT OBJECT LENGTH, LEVEL 6

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Estimate</th>
<th>Standard Error</th>
<th>95% Confidence Limits</th>
<th>Z</th>
<th>Pr &gt;</th>
<th>Z</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>1.6905</td>
<td>0.3944</td>
<td>0.9176</td>
<td>2.4635</td>
<td>4.29</td>
<td>&lt;.0001</td>
<td></td>
</tr>
<tr>
<td>condition A</td>
<td>0.0730</td>
<td>0.4109</td>
<td>-0.7324</td>
<td>0.8783</td>
<td>0.18</td>
<td>0.8590</td>
<td></td>
</tr>
<tr>
<td>condition B</td>
<td>-0.8887</td>
<td>0.3179</td>
<td>-1.5117</td>
<td>-0.2657</td>
<td>-2.80</td>
<td>*0.0052</td>
<td></td>
</tr>
<tr>
<td>condition C</td>
<td>-0.3450</td>
<td>0.2516</td>
<td>-0.8380</td>
<td>0.1481</td>
<td>-1.37</td>
<td>0.1703</td>
<td></td>
</tr>
<tr>
<td>condition D</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>.</td>
<td>.</td>
<td></td>
</tr>
<tr>
<td>length 0</td>
<td>0.2079</td>
<td>0.2882</td>
<td>-0.3569</td>
<td>0.7727</td>
<td>0.72</td>
<td>0.4706</td>
<td></td>
</tr>
<tr>
<td>length 1</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>.</td>
<td>.</td>
<td></td>
</tr>
</tbody>
</table>

A - metaphorical contiguous  B - metaphorical separated
C - directional contiguous  D - directional separated

* indicates a p-value of <.05
CHAPTER 5

DISCUSSION

In this chapter, I discuss how the results of this study come to bear on the research questions posed in Chapter 2 of this manuscript. The limitations in the design of the study are also outlined, and the implications of this study for future research in second language acquisition are explored.

5.1 DISCUSSION OF THE RESEARCH QUESTIONS

Research Question 1

RQ 1: Do syntactic and semantic complexity affect adult learners’ attention to variation in phrasal verb structure?

This research question is directly related to the sentence repetition task, in which participants listened to and repeated sentences with metaphorical and directional phrasal verbs in either contiguous or separated position. As reported in the previous chapter, the results of this task provided some very interesting patterns. The findings of the study indicate that sentence condition did have a significant effect ($p=.0009$) on sentence accuracy for nonnative speakers. Accuracy was lowest for sentences in the separated position (conditions B and D), with condition B (metaphorical phrasal verb in the separated position)
having the lowest percentage accuracy. Additionally, for the phrasal verbs in the contiguous position, nonnative speaker accuracy was lower for the metaphorical verbs than for the directional verbs (See Figure 5.1). Clearly, therefore, syntactic and semantic complexity do play a significant role in determining whether learners are able to successfully attend to variations in structure.

![FIGURE 5.1 SENTENCE REPETITION ACCURACY BY CONDITION](image)

The classification of patterns in errors made by nonnative speakers (Table 4.10) provides a more nuanced look at the errors made under certain sentence
conditions. Separation of the particle from the rest of the phrasal verb by placing the direct object in between significantly affected the likelihood that participants would choose not to attempt to repeat the sentence, would move the particle from its original position (1a), or would repeat the particle (1b) \( p < .0001 \) in each case; see Figure 5.2).

(1) a. “Mr. White filled out the job application.”

*(original sentence: Mr. White filled the job application out.)*

b. “The student picked up his blue pen up.”

*(original sentence: The student picked his blue pen up.)*
The tendency of nonnative speakers to not attempt a repetition of the sentences in which the phrasal verb appears in a separated position indicates that syntactic complexity does result in more problematic attention to structure, as might be expected. Furthermore, the tendency of participants to “correct” the separated structure by either moving the particle to a contiguous position (1a) or by moving the particle as well as repeating the particle in the position in which it was originally given (1b) indicates not only a difficulty in attending to the structure when the phrasal verb is in its separated position, but also that the contiguous position is more automatic for learners of English. This predisposition on the part of nonnative speakers is made clearer by the fact that participants moved the particle from an originally separated position in order to create a sentence containing a contiguous verb 40 times, but there were only three occurrences of participants moving an originally contiguous verb to the separated position.

Because no comprehension questions were included in this task, there is no evidence to show whether participants’ understanding of the sentences was affected by the semantic and syntactic complexity of the sentences they were asked to repeat. However, the presence of moved particle repetitions (2) does seem to imply some internalization of the original sentence (2a), as participants
were able to comprehend the purport of the sentence enough to produce a sentence with the same meaning, even though the structure was different (2b).

(2) a. original sentence: The girl put her yellow hat on.

b. student response: “The girl put on her yellow hat.”

Under VanPatten’s (1994, 2004a, 2007) model of Input Processing, therefore, it could be argued that the input has been processed; that is, the form has been linked to a meaning with enough accuracy to repeat back a sentence with the same meaning. This data therefore supports an argument that participants will process for meaning over form, as they seem to have internalized the meaning of the sentence even though they have not correctly attended to the syntactic structure in which it was provided.

Further, these results provide support for the claim that participants can have knowledge of items that is not necessarily indicated in their performance of the repetition (White, 1991). In other words, the participants may have processed the item even though they were unsuccessful in producing the correct structural output. These results may therefore be evidence of reception despite lack of proper production.

The results of the sentence repetition task also indicate that semantic complexity played a significant role in determining whether participants would make certain kinds of errors. In particular, participants were more likely (p <.
0001) to drop the particle of the phrasal verb if the verb was metaphorical in nature, rather than directional (3).

(3) a. original sentence: John made up a story about pirates.

b. student response: “John made a story about pirates.”

It is interesting to note that placement of the particle in the original sentence did not play a statistically significant role in determining whether the particle was dropped, even though it might be suspected that a particle separated from the verb would have a greater likelihood of being omitted from the repetition. This tendency of nonnative speakers to leave out particles for metaphorical verbs seems to indicate that the relationship between verb and particle in the metaphorical phrasal verb construction is more tenuous for nonnative speakers than the relationship between verb and particle in directional phrasal verbs.

The reason for a less concrete connection between verb and particle for metaphorical verbs is not entirely clear, as in both the list of metaphorical phrasal verbs and directional phrasal verbs used in this study, there are cases in which the omission of the particle does not drastically change the meaning of the sentence (4) and (5) and cases in which it does (6) and (7).

(4) metaphorical verbs

a. Mr. White filled out the job application.
b. Jane tore up the piece of paper.

(5) directional verbs

a. The woman hung up a new painting.

b. The teacher passed out the homework assignment.

(6) metaphorical verbs

a. My boss set up an office meeting.

b. The teacher broke down the difficult problem.

(7) directional verbs

a. The old man took off his jacket.

b. The little girl let in her dog.

It is possible that the more concrete meaning of the particle in the directional verbs as discussed in Chapter 3 of this manuscript contributes to the lack of particle omissions in sentences with directional verbs. Further, there is the possibility that the semantic complexity inherent in the metaphorical phrasal verbs results in their being less often taught to leaners of English as a second language, and that this unfamiliarity with metaphorical verbs led to an increase in repetition errors.

However, examining the proficiency levels separately provides evidence that counters the latter hypothesis. Each proficiency level group analyzed separately shows the same pattern for accuracy, with the lowest percent accuracy
for condition B, metaphorical verbs in separated position, (58.70% for level 5 and 65.81% for level 6), second lowest accuracy for condition D, separated directional verbs, (63.04% for level 5 and 71.62%), followed by condition A, contiguous metaphorical verbs, (71.20% level 5 and 85.16% level 6), and the highest percent accuracy for condition C, contiguous directional verbs (75.54% and 85.81%). However, while the level six group examined separately still shows a significant effect for accuracy by condition ($p=.0295$), the lower level proficiency group on its own does not show a statistically significant effect for condition ($p=.1286$). This discrepancy between levels makes the hypothesis that lack of knowledge of metaphorical verbs led to more repetition errors seem less likely, as it should be the case that the higher proficiency level students would have a greater knowledge of metaphorical phrasal verbs, which would in turn mitigate some of the effect of condition on repetition accuracy.

The native speaker control group completed the sentence repetition task with great accuracy; only three errors were found, and these three were spread across conditions (one each in A, B, and D). As such, there was clearly no association between condition and accuracy for the native speaker group; that is, syntactic and semantic complexity played no role in native speakers’ ability to accurately repeat the linguistic input. It is possible that this disparity between native and nonnative performance is a result of a greater working memory load.
required in processing a nonnative language. However, there has been little
evidence found so far that this is the case (Juffs, 2004). Further, it has been argued
(Clahsen and Felser, 2006) that if the differences between L1 and L2 linguistic
behavior were due to issues with working memory, L2 coping strategies should
be more like those of child L1 learners (i.e., an over-reliance on structural
information to the detriment of lexical-semantic information), when in fact, the
opposite is the case - L2 learners tend to ignore structural information and
instead focus on lexical-semantic information.

It may be concluded that native speakers succeeded in attending to both
the syntactic and semantic input in the sentences they were asked to repeat,
while nonnative speakers were less successful in doing so. While a combination
of semantic and syntactic complexity (condition B) resulted in the most
problematic repetitions for nonnative speakers, there was evidence for nonnative
speakers processing the semantic input but not the correct syntactic form.
Further, the data collected in this task provides evidence for nonnative speakers’
marked preference for the phrasal verb in contiguous form, while no such
preference was evident for native speakers. This indicates that phrasal verbs are
regarded as a single lexical item for nonnative speakers, while for native
speakers the separation of verb and particle occurs more freely.
Research Question 2

RQ 2: If so, to what extent do syntactic and semantic complexity affect:

(a) adult learners’ processing of written input?

(b) adult learners’ comprehension of written input?

Processing of written input was determined by use of the self-paced reading task which recorded the reading times of the phrasal verb + direct object chunk for each condition. As would be expected, the native speakers processed the chunks overall most quickly (mean of 429.23 milliseconds per word in the phrasal verb + direct object chunks), followed by the higher proficiency group (663.39 ms/word) and the lower proficiency group (748.91 ms/word).

Raw reading times for native speakers showed the fastest reading times for condition A, metaphorical verbs in contiguous position (416.36 ms/word), followed by condition C, directional verbs in contiguous position (423.68 ms/word), condition B, metaphorical verbs in separated position (436.03 ms/word) and condition D, directional verbs in separated position (440.85 ms/word). Statistical analysis by means of a repeated measures ANOVA showed that there were no statistically significant differences in processing times for any of the conditions for the native speaker group.

The raw reading times for the nonnative speakers, on the other hand, showed a different pattern of processing. The nonnative speakers as a whole read
condition C most quickly (678.98 ms/word), followed by conditions B and A, with very similar processing times (711.74 ms/word and 713.34 ms/word, respectively) and condition D read the most slowly (735.05 ms/word). Unlike the processing scores for native speakers, condition did prove to be a statistically significant factor in determining processing times for nonnative speakers. In particular, condition C was read significantly more quickly than the other sentence conditions ($p=0.0094$) (See Figure 5.3).

FIGURE 5.3 RAW READING TIMES BY CONDITION

![Graph showing raw reading times by condition](image-url)
Condition C, which has both the simpler syntactic form (the parts of the phrasal verb presented contiguously) and the simpler semantic category (the particle retains its directional sense, rather than being metaphorical in nature), was read significantly more quickly by nonnative speakers than the other conditions. However, the repeated measures ANOVA did not find a significant processing difference between any of the conditions except conditions C and D \((p=.0460)\). Because the difference between these conditions is in form rather than semantic classification, the data shows that syntactic complexity does play a role in determining processing time of phrasal verbs for nonnative speakers, but semantic complexity does not. It must be noted, however, that the difference between conditions A and B is also of syntactic complexity, and there was no statistically significant difference between the processing times of these two conditions.

The difference between the processing times of conditions C and D provides some support for Clahsen and Felser’s (2006, 2009) claim that processing differences between L1 and L2 speakers are a result of less efficient syntactic processing strategies on the part of L2 learners. When faced with a more complex syntactic structure, the predominantly lexically-based parsing strategies of nonnative speakers produce a shallower representation of the input, resulting in slower processing times. This effect is perhaps exacerbated by the
fact that the structure in question, the phrasal verb construction, while containing elements of both lexicon and syntax, seems to be regarded principally as a lexical item by nonnative speakers (as mentioned in the discussion of the previous research question). The breaking apart of the lexical item therefore causes significant strain to the lexically-based parsing mechanism of the nonnative speaker and results in less efficient processing than for native speakers, whose syntactic parsing strategies are more complete.

This explanation for the data is somewhat problematized when considering evidence from the other conditions studied. If it is true that nonnative speakers’ shallow representation of the syntax in separated position is the cause for the significant difference in processing time between conditions C and D, it should also be true that this difference would cause a similar distinction between conditions A and B. However, the evidence from this study shows that the processing times for nonnative speakers in these two conditions are very similar, the differences between them statistically insignificant (713.74 ms/word and 711.74 ms/word, respectively). Possibly a greater degree of familiarity with the directional verbs (conditions C and D) led to both faster processing of the verbs when in their simpler syntactic form and to slower processing when the familiar lexical item was separated. While resolution of this question will require
further evidence, it is certainly an issue that merits investigation in future studies.

Comprehension of written input was determined by use of true/false questions accompanying sentences on the self-paced reading task. Raw comprehension scores showed expected accuracy results for the various levels of proficiency, with native speakers performing the best (93.65% accurate), followed by level 6 learners of English (82.35%) and level 5 learners (77.55%). The overall accuracy for the nonnative speaker group as a whole was 79.81% (See figure 5.4).

![Figure 5.4: Comprehension Accuracy by Condition](image)

**FIGURE 5.4 COMPREHENSION ACCURACY BY CONDITION**
Logistic regression analysis showed no significant effect on accuracy by sentence condition for native speakers. When it came to the nonnative speaker group, however, sentence condition did play a statistically significant role in determining whether participants would correctly answer the comprehension questions. In particular, learners were significantly more likely to answer a question incorrectly ($p=0.0007$) if the sentence on which the question was based was a condition B sentence (a metaphorical phrasal verb in the separated form). Because condition B contains the more complex syntactic structure as well as the more complex semantic form, it can be concluded that semantic and syntactic complexity do play a role in nonnative speakers’ comprehension of written input.

However, the results of this study do not indicate that semantic or syntactic complexity alone had an effect on comprehension; only the combination of the two did so. In fact, nonnative speaker accuracy was highest (83.92%) for condition D, directional verbs in separated position. Therefore, although syntactic complexity did result in more problematic processing, as evidenced by the data in research question 2(a), this problematic processing of the syntax did not interfere with participants’ ability to understand the linguistic input. Instead, when the input was solely syntactically complex, the syntactic representations developed by nonnative speakers, while inefficient, were successful in their
ultimate goal - mapping form to meaning. It is only when the more difficult syntactic processing was combined with a more complex semantic environment (condition B) that the form-function mapping system broke down and caused significant errors in comprehension.

Research Question 3

RQ 3: To what extent does direct object weight affect:

(a) adult learners’ processing of written input?

(b) adult learners’ comprehension of written input?

Research question 3 was investigated by incorporating direct objects of greater length in the self-paced reading task. Providing a heavier direct object was assumed to increase difficulty in both processing and comprehension, particularly in the conditions in which the particle was separated from the rest of the phrasal verb across the greater distance of the heavier direct object.

However, direct object length was not shown to be a significant factor in processing of written input for either native speakers \( (p=.2928) \) or nonnative speakers \( (p=.1036) \). Furthermore, neither of the nonnative proficiency groups showed any effect for direct object length on processing (level 5, \( p=.1529 \); level 6, \( p=.4333 \)). Comprehension of written input was also not shown to be significantly
affected by direct object length for any of the groups (native speakers, \( p = .1772 \); nonnative speakers, \( p = .2812 \); level 5, \( p = .4292 \); level 6, \( p = .4706 \)).

While syntactic complexity alone did not affect comprehension, it did result in less efficient processing, as discussed in research question 2 above. However, since direct object length did not result in more problematic processing, data from the current study indicates that, contrary to expectation, separating the verb and particle with a longer direct object does not play a role in increasing syntactic complexity as defined by this study\(^{iii}\). The role of direct objects in increasing syntactic complexity in nonnative speaker processing, while peripheral in the current study, is worthy of greater scrutiny in future research.

5.2 LIMITATIONS OF THE STUDY

This section outlines some of the limitations of the current study, and discusses how the limitations may have come to bear on the results of the study.

The sentence repetition task utilized in this study was designed to test participants’ attention to variations in syntax under differing syntactic and semantic conditions. Each sentence to be repeated was of the same length, and was kept short (eight items per sentence) in order to minimize complications due

\(^{iii}\) It should be noted, however, that the direct objects used in this study were all of unquestionable grammaticality. Direct objects that are so heavy as to lead to doubtful grammaticality, as discussed in Chapter 3, would almost certainly significantly increase difficulty in processing an utterance.
to differences in working memory. However, it must be considered that individual differences in working memory may have played a role in the results of the sentence repetition task. Future studies may wish to employ a working memory task to determine whether working memory plays a role in an individual participant’s performance on this type of task.

While the design of the study was intended to minimize the effects of participants’ ignorance of a certain phrasal verb’s meaning by repeating verbs across conditions, it is still possible that lack of knowledge of certain verbs may have played a role in the results of this study. Future studies of this type could include a pre-test task to determine participants’ knowledge of phrasal verbs prior to administering the sentence repetition and self-paced reading tasks.

Further, the results of this study show several discrepancies between proficiency levels of nonnative speakers. It would therefore be useful in future studies to have more proficiency levels represented in the sample. In particular, a more advanced, near-native L2 English group would provide valuable data toward answering the questions posed by this study. It would also be useful to include another measure of determining proficiency to ensure that participants are appropriately classified according to proficiency.

The distinction between metaphorical and directional phrasal verbs is important in this study, as it serves to determine the semantic complexity of a
given sentence. However, like many semantic divisions, the distinction between a metaphorical and directional phrasal verb can be difficult to determine. In this study, the division was determined with the assistance of ten linguistics graduate students, all native speakers of English. The volunteers were given the survey found in Appendix I and were asked to decide whether the particle of the phrasal verb retains its directional quality (and is therefore a directional verb), or does not (a metaphorical verb). Any verb for which a large majority (75% or more) of participants could not agree was eliminated from use in this study. While I believe that this procedure was valid for the current study, future studies may develop a more advanced method for distinguishing between directional and metaphorical phrasal verbs.

In this study, the same group of participants were used in both of the tasks. Having the participants undergo the sentence repetition task prior to the self-paced reading task may have had the effect of inadvertently priming them for the self-paced reading task. While the filler items included in both tasks were meant to prevent participants from realizing that the phrasal verb was the construction under investigation and therefore causing them to focus on these items, it is possible that using the same participants in both tasks did have this effect. Future research of this kind may choose to have two groups of
participants, or, alternatively, to spread out the tasks to minimize the possibility of this effect.

5.3 DIRECTIONS FOR FUTURE RESEARCH

In addition to addressing the limitations set out in the previous section, future research on this topic would benefit from considering the following points.

Provided with the initial results set forth in the current study, future studies on attention to and processing of phrasal verbs may gather additional evidence by the use of eye-tracking technology, which could provide data on the kinds of movements that participants’ eyes make while reading the phrasal verb texts under different conditions. Given the current evidence that syntactic complexity in phrasal verb constructions does lead to less efficient processing in nonnative speakers, eye tracking technology could provide more specific data as to how learners are processing these structures.

Despite the prevalence of phrasal verb constructions in the English language and the clear difficulty that nonnative speakers have with the structure, there is relatively little research in the literature about how nonnative speakers attend to and process these constructions. Future research could deal with some of the other issues with phrasal verb constructions that were not investigated in
this study, such as the behavior of transitive phrasal verbs with direct object pronouns. Direct object pronouns were not included in the current study because their use eliminates syntactic optionality (1) - (4).

(1) a. John picked up the blue pen.

   b. John picked the blue pen up.

(2) a. John picked it up.

   b. *John picked up it.

(3) a. John picked up his son.

   b. John picked his son up.

(4) a. John picked him up.

   b. *John picked up him.

The necessity of using the separated verbal form with pronouns is especially interesting when considering nonnative speakers’ significant preference for the phrasal verbs in their contiguous forms. Future research into how this issue affects the concepts discussed in this study would certainly be beneficial in understanding nonnative speakers’ strategies for processing phrasal verbs.
CHAPTER 6

CONCLUSIONS

This study has attempted to shed new light on second language attention and processing by exploring how these components of language are affected by a lexical item that also contains elements of syntactic variability. The results of the sentence repetition task in this study have shown that participants seem to be able to process the meaning of the lexical item without attending to the structure intrinsically tied to the use of the verb in the sentence (as repeated in (1), below).

(1). a. “Mr. White filled out the job application.”

(original sentence: Mr. White filled the job application out.)

b. “The student picked up his blue pen up.”

(original sentence: The student picked his blue pen up.)

This type of error was not rare in the study, occurring in 19.2% of the errors made by nonnative speakers, and a full 37.7% of errors in which an intelligible response was actually given. This seems to indicate that when a lexical item contains elements of both syntax and lexicon, the noticing of the grammatical-structural elements of the item occurs separately from the noticing of lexical-semantic elements within the same item, and further, that the prioritization of
meaning over form occurs even within a single expression. In other words, there appears to be no obligatory link between the noticing of the syntax in a multi-word lexical item and the processing of the item.

Regarding the effect of syntactic and structural complexity on attention to structure and processing of written input, it seems to be the combination of both of these that results in both the inability to attend to structure in input and the lack of comprehension of the input. This is unsurprising, since the combination of semantic and syntactic complexity would seem most likely to exhaust attentional resources and force participants to prioritize meaning in the first case, and to cause them to actually fail to make meaning out of the complex input in the second. As for processing efficiency, while it was the syntactically and semantically simple input that was read the most quickly, the only statistically significant difference in reading times was seen between conditions of different syntactic structure, pointing to the fact that syntactic complexity in multi-word expressions is generally more likely to cause problems in processing than semantic complexity. However, since we see that syntactic complexity alone was not significantly more likely to cause comprehension problems, it seems that syntactic processing inefficiencies were not sufficient to impede comprehension. This result is echoed in the sentence repetition task, where it once again appears
to be the case that comprehension is not necessarily affected by failure to properly attend to syntactic input.

The phrasal verbs in this study, transitive phrasal verbs that are capable of separating across direct object, are the largest and most productive type of phrasal verb in English (Celce-Murcia and Larsen-Freeman, 1999). Failure to properly use and understand these verbs has already been noted to restrict nonnative speakers from achieving native-like proficiency in English (Dagut and Laufer, 1985), and it appears that this will become even more true as more transitive phrasal verbs are added to the English language. It is therefore important that English instructors not only have a solid understanding of the functioning of these verbs themselves, but also that they understand how transitive phrasal verbs are processed by learners of English.

The results of this study indicate that nonnative speakers show a marked preference for phrasal verbs in their contiguous position which native speakers do not appear to exhibit. This may be in part a result of the way phrasal verbs are taught in the classroom, as a single vocabulary word. While this approach is not necessarily flawed, since learners of English seem to be able to understand the verbs in their separated position, it may be exacerbating the processing inefficiencies that occur when the phrasal verb is separated by a direct object. It has been observed in this study that the separation of directional phrasal verbs,
which are generally more frequently taught in the English classroom, caused a significant slowing of processing time when compared to directional verbs that were not separated. This result was not seen in metaphorical phrasal verbs, which are less frequently a focus in the classroom. It seems likely that the frequent teaching of directional phrasal verbs as single lexical units contributes to slower processing when they are separated, and it would therefore perhaps be beneficial for English teachers to de-emphasize the attachment of verb and particle in transitive phrasal verbs.


## APPENDIX A

### PARTICIPANT DATA

#### TABLE A.1 PARTICIPANT DATA

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</table>
APPENDIX B

SENTENCE REPETITION TASK ITEMS

Tokens

Condition A, metaphorical contiguous

1. The boy figured out the correct answer.

2. The author thought up a new story.

3. My boss set up an office meeting.

4. The children blew up some red balloons.

5. The teacher broke down the difficult problem.

6. John made up a story about pirates.

Condition B, metaphorical separated

1. Mr. White filled the job application out.

2. Jane tore the piece of paper up.

3. Mary dropped her children off at school.

4. Mrs. Green cleaned the dirty kitchen up.

5. Joe looked the new vocabulary word up.

6. The student sorted his school papers out.
\textit{Condition C, directional contiguous}

1. Mr. Brown cut down a tall tree.
2. The workers took apart the old building.
3. The teacher passed out the homework assignment.
4. The old man took off his jacket
5. The little boy put together the puzzle.
6. The students put down their pencils.

\textit{Condition D, directional separated}

1. The woman hung a new painting up.
2. The little girl let her dog in.
3. The student picked his blue pen up.
4. Miss Smith handed the grammar exam out.
5. My sister sent the damaged package back.
6. The girl put her yellow hat on.

\textit{Fillers}

1. Lisa likes to go to the movies
2. The children want to eat some pizza.
3. Susan has three cats and a dog.
4. The boys are eating in the kitchen.

5. Carrie’s doctor gave her a new prescription.

6. Jim thinks his math teacher is mean.

7. Mr. Jones was arrested by the police.

8. The woman wore a pale pink dress.

9. The little girl played with her doll.

10. My new shoes are blue and black.

11. Some of the students failed the test.

12. The flowers needed more rain to grow.
## APPENDIX C

### SENTENCE REPETITION TASK, VERSION 1

<table>
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<td>Lisa likes to go to the movies</td>
</tr>
<tr>
<td>2</td>
<td>C</td>
<td>The old man took off his jacket</td>
</tr>
<tr>
<td>3</td>
<td>B</td>
<td>Mary dropped her children off at school.</td>
</tr>
<tr>
<td>4</td>
<td>filler</td>
<td>The woman wore a pale pink dress.</td>
</tr>
<tr>
<td>5</td>
<td>A</td>
<td>The author thought up a new story.</td>
</tr>
<tr>
<td>6</td>
<td>filler</td>
<td>Jim thinks his math teacher is mean.</td>
</tr>
<tr>
<td>7</td>
<td>D</td>
<td>My sister sent the damaged package back.</td>
</tr>
<tr>
<td>8</td>
<td>C</td>
<td>Mr. Brown cut down a tall tree.</td>
</tr>
<tr>
<td>9</td>
<td>filler</td>
<td>Carrie’s doctor gave her a new prescription.</td>
</tr>
<tr>
<td>10</td>
<td>D</td>
<td>The little girl let her dog in.</td>
</tr>
<tr>
<td>11</td>
<td>filler</td>
<td>The children want to eat some pizza.</td>
</tr>
<tr>
<td>12</td>
<td>B</td>
<td>Jane tore the piece of paper up.</td>
</tr>
<tr>
<td>13</td>
<td>A</td>
<td>The teacher broke down the difficult problem.</td>
</tr>
<tr>
<td>14</td>
<td>filler</td>
<td>The boys are eating in the kitchen.</td>
</tr>
<tr>
<td>15</td>
<td>C</td>
<td>The students put down their pencils.</td>
</tr>
<tr>
<td>16</td>
<td>D</td>
<td>The girl put her yellow hat on.</td>
</tr>
<tr>
<td>17</td>
<td>filler</td>
<td>My new shoes are blue and black.</td>
</tr>
<tr>
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<tr>
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<tr>
<td>18</td>
<td>B</td>
<td>Mrs. Green cleaned the dirty kitchen up.</td>
</tr>
<tr>
<td>19</td>
<td>A</td>
<td>John made up a story about pirates.</td>
</tr>
<tr>
<td>20</td>
<td>filler</td>
<td>Some of the students failed the test.</td>
</tr>
<tr>
<td>21</td>
<td>C</td>
<td>The workers took apart the old building.</td>
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<tr>
<td>22</td>
<td>B</td>
<td>Mr. White filled the job application out.</td>
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<tr>
<td>23</td>
<td>filler</td>
<td>Mr. Jones was arrested by the police.</td>
</tr>
<tr>
<td>24</td>
<td>D</td>
<td>The woman hung a new painting up.</td>
</tr>
<tr>
<td>25</td>
<td>C</td>
<td>The teacher passed out the homework assignment.</td>
</tr>
<tr>
<td>26</td>
<td>filler</td>
<td>The flowers needed more rain to grow.</td>
</tr>
<tr>
<td>27</td>
<td>A</td>
<td>My boss set up an office meeting.</td>
</tr>
<tr>
<td>28</td>
<td>D</td>
<td>The student picked his blue pen up.</td>
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<tr>
<td>29</td>
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<td>Susan has three cats and a dog.</td>
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<tr>
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<tr>
<td>31</td>
<td>C</td>
<td>The little boy put together the puzzle.</td>
</tr>
<tr>
<td>32</td>
<td>D</td>
<td>Miss Smith handed the grammar exam out.</td>
</tr>
<tr>
<td>33</td>
<td>A</td>
<td>The boy figured out the correct answer.</td>
</tr>
<tr>
<td>34</td>
<td>B</td>
<td>Joe looked the new vocabulary word up.</td>
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<tr>
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<tr>
<td>36</td>
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<td>The children blew up some red balloons.</td>
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## Appendix D

### Sentence Repetition Task, Version 2

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<td>The children blew up some red balloons.</td>
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<td>filler</td>
<td>The flowers needed more rain to grow.</td>
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<tr>
<td>6</td>
<td>D</td>
<td>The woman hung a new painting up</td>
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<tr>
<td>7</td>
<td>B</td>
<td>The student sorted his school papers out.</td>
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<tr>
<td>8</td>
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<td>Carrie’s doctor gave her a new prescription.</td>
</tr>
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<td>A</td>
<td>The author thought up a new story.</td>
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<td>10</td>
<td>filler</td>
<td>Some of the students failed the test.</td>
</tr>
<tr>
<td>11</td>
<td>C</td>
<td>Mr. Brown cut down a tall tree.</td>
</tr>
<tr>
<td>12</td>
<td>D</td>
<td>Miss Smith handed the grammar exam out.</td>
</tr>
<tr>
<td>13</td>
<td>filler</td>
<td>Mr. Jones was arrested by the police.</td>
</tr>
<tr>
<td>14</td>
<td>B</td>
<td>Mary dropped her children off at school.</td>
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<td>15</td>
<td>C</td>
<td>The teacher passed out the homework assignment.</td>
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<tr>
<td>16</td>
<td>D</td>
<td>My sister sent the damaged package back.</td>
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<td>The children want to eat some pizza.</td>
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<td>Joe looked the new vocabulary word up.</td>
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<td>21</td>
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<td>The old man took off his jacket</td>
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<td>A</td>
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<td>My new shoes are blue and black.</td>
</tr>
<tr>
<td>36</td>
<td>D</td>
<td>The student picked his blue pen up.</td>
</tr>
</tbody>
</table>
## APPENDIX E

### SENTENCE REPETITION TASK, VERSION 3

<table>
<thead>
<tr>
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<tr>
<td>36</td>
<td>filler</td>
</tr>
</tbody>
</table>
Sentence Repetition Activity

This activity will start and proceed automatically. Please do not touch the computer keyboard or mouse at all during this activity.

Instructions

This activity involves listening to a series of short sentences in English one at a time and repeating them back after you have heard them.

This is a listening activity. At this point, you should be able to hear these instructions. If you do not hear anything, raise your hand for assistance.
Instructions

While you can currently both read and hear these instructions, none of the sentences that you are to repeat will appear on the screen. Please listen to the sentence, and then repeat it into your microphone.

This activity is timed and will proceed automatically. After you have heard the sentence and had time to repeat, there will be a short pause, and the next item will appear automatically. Please do not touch the computer keyboard or mouse at any time.

The first two sentences are for practice.

#1

Listen and repeat
APPENDIX G

SELF-PACED READING TASK ITEMS

Tokens
1.
   a. The construction crew blew up the old building on Main Street last week.
   b. The construction crew blew the old building on Main Street up last week
   c. The construction crew took apart the old building on Main Street last week
   d. The construction crew took the old building on Main Street apart last week

2.
   a. The teacher breaks down the problem from the textbook for the students.
   b. The teacher breaks the problem from the textbook down for the students.
   c. The teacher turned down the volume on the computer for the students.
   d. The teacher turned the volume on the computer down for the students.

3.
   a. Jane picks out a hat with a yellow band before she goes outside
   b. Jane picks a hat with a yellow band out before she goes outside
   c. Jane puts on a hat with a yellow band before she goes outside.
   d. Jane puts a hat with a yellow band on before she goes outside.

4.
   a. Susan tore up the piece of paper before she left class.
b. Susan tore the piece of paper up before she left class.
c. Susan threw away the piece of paper before she left class
d. Susan threw the piece of paper away before she left class

5.
a. Jill sets up the cups with the red stripes for the party
b. Jill sets the cups with the red stripes up for the party
c. Jill fills up the cups with the red stripes for the party.
d. Jill fills the cups with the red stripes up for the party.

6.
a. The gardener will check out the tree in my backyard tomorrow afternoon.
b. The gardener will check the tree in my backyard out tomorrow afternoon.
c. The gardener will cut down the tree in my backyard tomorrow afternoon.
d. The gardener will cut the tree in my backyard down tomorrow afternoon.

7.
a. Sometimes Amanda mixes up her clothes with her sister's clothes.
b. Sometimes Amanda mixes her clothes up with her sister's clothes.
c. Sometimes Amanda hangs up her clothes with her sister's clothes.
d. Sometimes Amanda hangs her clothes up with her sister's clothes.

8.
a. Jack cleans up the garbage in the kitchen every Tuesday.
b. Jack cleans the garbage in the kitchen up every Tuesday.
c. Jack takes out the garbage in the kitchen every Tuesday.
d. Jack takes the garbage in the kitchen out every Tuesday.
9.
a. He made up a story about dragons and fairies for his creative writing class.
b. He made a story about dragons and fairies up for his creative writing class.
c. He handed in a story about dragons and fairies for his creative writing class.
d. He handed a story about dragons and fairies in for his creative writing class.

10.
a. Peter held up the bank for the money he owed.
b. Peter held the bank up for the money he owed.
c. Peter paid back his sister for the money he owed her.
d. Peter paid his sister back for the money he owed her.

11.
a. The driver drops off the car at the parking garage.
b. The driver drops the car off at the parking garage.
c. The man let in the dog at the back gate.
d. The man let the dog in at the back gate.

12.
a. Joe backed up his new truck at the car lot.
b. Joe backed his new truck up at the car lot.
c. Joe put down his car keys on the kitchen table.
d. Joe put his car keys down on the kitchen table.

13.
a. The robot can figure out a puzzle with a thousand pieces in two minutes.
b. The robot can figure a puzzle with a thousand pieces out in two minutes.
c. The robot can put together a puzzle with a thousand pieces in two minutes.
d. The robot can put a puzzle with a thousand pieces together in two minutes.

14.
a. The instructor brought up the exam to the students.
b. The instructor brought the exam up to the students.
c. The instructor handed out the exam to the students
d. The instructor handed the exam out to the students.

15.
a. The researcher writes up the report for the journal.
b. The researcher writes the report up for the journal.
c. The professor passes out the article to the students.
d. The professor passes the article out to the students.

16.
a. The English teacher thought up an assignment about indirect objects for her class.
b. The English teacher thought an assignment about indirect objects up for her class.
c. The English teacher picked up an assignment about indirect objects from her students.
d. The English teacher picked an assignment about indirect objects up from her students.
17.
a. The student looked up the book about Thomas Jefferson in the library.
b. The student looked the book about Thomas Jefferson up in the library
c. The student put down the book about Thomas Jefferson in the library.
d. The student put the book about Thomas Jefferson down in the library.

18.
a. The general called off the soldiers from the battle.
b. The general called the soldiers off from the battle.
c. The general brought back the soldiers from the battle.
d. The general brought the soldiers back from the battle.

19.
a. The friends blew up some balloons for the school dance.
b. The friends blew some balloons up for the school dance.
c. The friends picked up some balloons for the school dance.
d. The friends picked some balloons up for the school dance.

20.
a. James crossed out the vocabulary words after he had learned them.
b. James crossed the vocabulary words out after he had learned them.
c. James threw away his vocabulary list when he was finished with it.
d. James threw his vocabulary list away when he was finished with it.

21.
a. Amelia tried to cheer up her friend when she saw he was sad.
b. Amelia tried to cheer her friend up when she saw he was sad.
c. Amelia sent back the dress when she noticed it had a tear.

22.

a. The girl gave up the puppy from the animal shelter because it was noisy.
b. The girl gave the puppy from the animal shelter up because it was noisy.
c. The girl cut off the tag from her new dress because it was itchy.
d. The girl cut the tag from her new dress off because it was itchy.

23.

a. The student figured out the answer after thinking about it for five minutes.
b. The student figured the answer out after thinking about it for five minutes.
c. The student gave back the book after borrowing it for two weeks.
d. The student gave the book back after borrowing it for two weeks.

24.

a. My friend gave away the end of the movie before I had seen it.
b. My friend gave the end of the movie away before I had seen it.
c. My friend turned up the sound on the television before the show came on.
d. My friend turned the sound on the television up before the show came on.

25.

a. John wanted to think over the job offer before making a decision.
b. John wanted to think the job offer over before making a decision.
c. John wanted to try on the new suit before making a decision.
d. John wanted to try the new suit on before making a decision.
26.
  a. The student let down his teacher by not turning in his homework.
  b. The student let his teacher down by not turning in his homework.
  c. The boy let in the cat by opening the front door.
  d. The boy let the cat in by opening the front door.

27.
  a. The student looked up a word in the dictionary.
  b. The student looked a word up in the dictionary.
  c. The man hung up a painting in his office.
  d. The man hung a painting up in his office.

28.
  a. I gave away my book because I didn’t need it.
  b. I gave my book away because I didn’t need it.
  c. Alex took off his jacket because he was warm.
  d. Alex took his jacket off because he was warm.

29.
  a. Mary cleaned up the house before her friends came over.
  b. Mary cleaned the house up before her friends came over.
  c. Mary picked up her umbrella before she went outside.
  d. Mary picked her umbrella up before she went outside.

30.
  a. John filled out the university application before the deadline.
  b. John filled the university application out before the deadline.
c. John sent back the university application before the deadline.
d. John sent the university deadline back before the deadline.

31.
a. Mr. Simpson sorts out the coupons to use at the grocery store.
b. Mr. Simpson sorts the coupons out to use at the grocery store.
c. Mr. Simpson cuts out the coupons to use at the grocery store.
d. Mr. Simpson cuts the coupons out to use at the grocery store.

32.
a. Susie filled out a job application at the clothing store.
b. Susie filled a job application out at the clothing store.
c. Susie picked up a job application at the clothing store.
d. Susie picked a job application up at the clothing store.

Fillers

1.
a. Jane has given a book to her sister.
b. Jane has given her sister a book.
c. Jane has sold a book to her sister.
d. Jane has sold her sister a book.

2.
a. Michael often writes letters to his penpal.
b. Michael often writes his penpal letters.
c. Michael often sends letters to his penpal.
d. Michael often sends his penpal letters

3.
   a. The teacher bakes some cookies for the children.
   b. The teacher bakes the children some cookies.
   c. The teacher brings some cookies for the children.
   d. The teacher brings the children some cookies.

4.
   a. The ring master offered a peanut to the elephant.
   b. The ring master offered the elephant a peanut.
   c. The ring master gave a peanut to the elephant.
   d. The ring master gave the elephant a peanut.

5.
   a. I made a cake for my sister for her birthday.
   b. I made my sister a cake for her birthday.
   c. I cooked a cake for my sister for her birthday.
   d. I cooked my sister a cake for her birthday.

6.
   a. The little girl fed a treat to her puppy.
   b. The little girl fed her puppy a treat.
   c. The little girl threw a treat to her puppy.
   d. The little girl threw her puppy a treat.
7.
   a. The saleswoman sold the customer a skirt.
   b. The saleswoman sold a skirt to the customer.
   c. The saleswoman showed a skirt to the customer.
   d. The saleswoman showed the customer a skirt.

8.
   a. The mother promised a piece of candy to her child.
   b. The mother promised her child a piece of candy.
   c. The mother handed a piece of candy to her child.
   d. The mother handed her child a piece of candy.

9.
   a. The doctor prescribed some medication to his patient.
   b. The doctor prescribed his patient some medication.
   c. The doctor gave some medication to his patient.
   d. The doctor gave his patient some medication.

10.
    a. The boy passed the ball to his teammate.
    b. The boy passed his teammate the ball.
    c. The boy threw the ball to his teammate.
    d. The boy threw his teammate the ball.

11.
    a. Jack ordered a gift for his sister online.
    b. Jack ordered his sister a gift online.
c. Jack bought a gift for his sister online.
d. Jack bought his sister a gift online.

12.
a. The casino worker dealt some cards to the players.
b. The casino worker dealt the players some cards.
c. The casino worker passed some cards to the players.
d. The casino worker passed the players some cards.

13.
a. The police officer denied a phone call to the prisoner.
b. The police officer denied the prisoner a phone call.
c. The police officer offered a phone call to the prisoner.
d. The police officer offered the prisoner a phone call.

14.
a. The little boy drew a picture for his mother.
b. The little boy drew his mother a picture.
c. The little boy colored a picture for his mother.
d. The little boy colored his mother a picture.

15.
a. The architect designed a house for his family.
b. The architect designed his family a house.
c. The architect built a house for his family.
d. The architect built his family a house.
16.
   a. The bartender called a cab for the customer.
   b. The bartender called the customer a cab.
   c. The bartender ordered a cab for the customer.
   d. The bartender ordered the customer a cab.

17.
   a. Sally did a favor for her friend.
   b. Sally did her friend a favor.
   c. Sally promised a favor to her friend.
   d. Sally promised her friend a favor.

18.
   a. Rose found a dress for her mother.
   b. Rose found her mother a dress.
   c. Rose sewed a dress for her mother.
   d. Rose sewed her mother a dress.

19.
   a. The judge granted immunity to the witness.
   b. The judge granted the witness immunity.
   c. The judge offered immunity to the witness.
   d. The judge offered the witness immunity.

20.
   a. Joe owed $50 to his friend.
   b. Joe owed his friend $50.
c. Joe loaned $50 to his friend.
d. Joe loaned his friend $50.

21.
a. Cecelia brought a pizza to her friends at 7 o’clock in the evening.
b. Cecelia brought her friends a pizza at 7 o’clock in the evening.
c. Cecelia baked a pizza for her friends at 7 o’clock in the evening.
d. Cecelia baked her friends a pizza at 7 o’clock in the evening.

22.
a. Joe lent a pencil to his friend so that she could complete the assignment.
b. Joe lent his friend a pencil so that she could complete the assignment.
c. Joe passed some paper to his friend so that she could complete the assignment.
d. Joe passed his friend some paper so that she could complete the assignment.

23.
a. The father read a story to his children before bedtime.
b. The father read his children a story before bedtime.
c. The father gave a snack to his children before bedtime.
d. The father gave his children a snack before bedtime.

24.
a. Amy promised a trip to the movies to her children.
b. Amy promised her children a trip to the movies.
c. Amy offered a trip to the movies to her children.
d. Amy offered her children a trip to the movies.
25.
a. Ben purchased an engagement ring for his fiancee.
b. Ben purchased his fiancee an engagement ring.
c. Ben ordered an engagement ring for his fiancee.
d. Ben ordered his fiancee an engagement ring.

26.
a. Max saved a seat on the bus for his friend.
b. Max saved his friend a seat on the bus.
c. Max found a seat on the bus for his friend.
d. Max found his friend a seat on the bus.

27.
a. The waiter served some tea to the customers in the restaurant.
b. The waiter served the customers in the restaurant some tea.
c. The waiter brought some tea to the customers in the restaurant.
d. The waiter brought the customers in the restaurant some tea.

28.
a. The quarterback threw the football to the wide receiver and scored a touchdown.
b. The quarterback threw the wide receiver the football and scored a touchdown.
c. The quarterback passed the football to the wide receiver and scored a touchdown.
d. The quarterback passed the wide receiver the football and scored a touchdown.
29.
   a. Lisa fed some tuna fish to her cat.
   b. Lisa fed her cat some tuna fish.
   c. Lisa gave some tuna fish to her cat.
   d. Lisa gave her cat some tuna fish.

30.
   a. The teacher handed some books to his students.
   b. The teacher handed his students some books.
   c. The teacher showed some books to his students.
   d. The teacher showed his students some books.

31.
   a. Margaret took some flowers to her friend in the hospital.
   b. Margaret took her friend in the hospital some flowers.
   c. Margaret bought some flowers for her friend in the hospital.
   d. Margaret bought her friend in the hospital some flowers.

32.
   a. Thomas built a toy car for his nephew.
   b. Thomas built his nephew a toy car.
   c. Thomas made a toy car for his nephew.
   d. Thomas made his nephew a toy car.
This reading activity consists of 64 sentences that will be presented one word at a time.

Press the spacebar to receive the next word in the sentence.

Read each sentence carefully; some sentences are followed by true/false questions.

Name: 

Age: 

RV level: 

Native Language: 

→ Click here to continue
progress

figured

The student didn’t know the word.

1. true
2. false
Wrong. Please wait for the next sentence.
APPENDIX I

PHRASAL VERB CLASSIFICATION POLL

Verb-particle constructions

Please mark the following verbal constructions as either metaphorical (if you perceive the verb’s definition as having no relation to the individual meaning of the particle) or non-metaphorical (if the directional quality of the particle is somehow reflected in the meaning of the verb).

1. back up to reverse
2. blow up to cause to explode
3. break down to divide into smaller parts
4. bring up to raise (a child)
5. call off to cancel
6. call up to telephone
7. check out to look at carefully, investigate
8. cheer up to make happier
9. clean up to make tidier
10. cross out       to draw a line through
11. cut down       to make something fall to the ground
12. cut off         to remove with something sharp
13. drop off        to take something/someone somewhere and leave it/them there
14. figure out      to understand, find the answer
15. fill out        to write information in blanks
16. fill up         to fill to the top
17. get back        to receive something you had before
18. give up         to quit
19. hand in         to submit
20. hand out        to distribute
21. hand over       to give (usually willingly)
22. hold up         to rob
23. keep up         to continue at the same rate
24. let down        to disappoint
25. let in          to allow someone to enter
26. look over       to check/examine
27. look up         to search in a database or reference
28. make up         to invent, lie about something
29. mix up          to confuse two or more things
30. pass out  to give the same thing to many people
31. pay back  to return owed money
32. pick out  to choose
33. point out  to indicate with the finger
34. put down  to put something you are holding on a surface or the floor
35. put on    to put clothing/accessories on your body
36. put together to assemble
37. send back  to return
38. set up     to arrange, organize
39. sort out   to organize, resolve a problem
40. take apart to purposely break into pieces
41. take back  to return
42. take off   to remove
43. take out   to remove from a place
44. tear up    to rip into pieces
45. think over to consider
46. turn off   to stop the energy flow
47. turn on    to start the energy flow
48. warm up   to increase the temperature