LEARNING WORDS IN CONTEXT: AN ERP INVESTIGATION OF WORD EXPERIENCE EFFECTS ON FAMILIARITY AND MEANING ACQUISITION

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LEARNING WORDS IN CONTEXT: AN ERP INVESTIGATION OF WORD

EXPERIENCE EFFECTS ON FAMILIARITY AND MEANING ACQUISITION

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Using an instance-based approach to word learning (Reichle & Perfetti, 2003), two experiments tested the general hypothesis that differences in word experience give rise to encoded memories of words that differ in strength and quality, and that these differences affect meaning acquisition and subsequent word processing. Adult learners were exposed to rare unknown words in contexts that differed by type (definition or sentence context), variability (varied or repeated content), and semantic constraint (high or low) in an incidental word learning paradigm. Words were learned over the exposure of four learning trials that was followed by a testing phase during which ERPs were recorded. Of interest were the FN400, P600, and N400 components, which are neural signatures of familiarity, recollection, and meaning acquisition, respectively. Learners completed three tasks (semantic judgment, sentence judgment, and definition generation) that measured their acquisition of definitional and contextual meaning knowledge. For Experiment 1, the type of context and variability of content were manipulated. Our results showed FN400 effects for definition conditions, and N400 effects for varied context conditions, indicating differential effects of word experience for familiarity and meaning acquisition. For Experiment 2, the semantic constraint and the variability of single-sentence contexts were manipulated. Familiarity effects as indexed by the FN400 indicated an effect for repetition; words learned in repeated contexts of high or low semantic constraint showed increased familiarity, whereas no

familiarity effects were found for varied content conditions. Differences in N400 effects were found for contextual-related decisions; larger N400 effects were found for varied content conditions that facilitated the acquisition of the contextual knowledge of the word. Correlations with ERP effects, behavioral measures, and individual difference measures showed that the acquisition of meaning knowledge is related to vocabulary, comprehension, and lexical skill. These results suggest that different word experiences have differential effects on word familiarity and meaning acquisition, and that these differences can be interpreted in terms of the strength, quantity, and availability of the encoded memory traces for those word experiences.

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PREFACE

To Laura: Your presence and friendship has made all the difference.

1.0   INTRODUCTION

1.1   OVERVIEW

The purpose of this research was to examine the effects of word experience on adult meaning acquisition, familiarity, and retrieval. In the two experiments reported here, adult learners were presented with previously unknown vocabulary words in several different learning conditions. Using the instance-based memory approach (e.g., Reichle & Perfetti, 2003) as the overarching framework of this research, two experiments tested the main hypothesis that encoded memories of individual experiences with words (instances) affect word familiarity and meaning acquisition. These learning-related changes associated with word experience were investigated by recording event-related brain potentials (ERPs) because this approach allows us to obtain information on the order of milliseconds on the time course of word processing (e.g., meaning retrieval). This approach may be used to distinguish among other cognitive events that occur at word learning (e.g., recognizing a word as familiar versus recognizing a word as recently experienced). Using an incidental learning paradigm, Experiment 1 examined the consequences of context type (definition or sentence) and variability (repeated or varied) on word learning and familiarity; Experiment 2 examine the effects of variability and contextual semantic constraint (high or low) on the process of inferring word meaning from context (e.g., Fukkink, 2005; McKeown, 1985).

1.2 BACKGROUND

Knowledge of words and their meanings is critical for reading comprehension. Efficient and accurate verbal comprehension skills depend on knowing many words in the language (Anderson & Freebody, 1981; Sternberg & Powell, 1983), and that the underlying meaning of these words can be easily and reliably accessed (Perfetti, 1985). Theories of reading comprehension, such as the Verbal Efficiency Theory (Perfetti, 1985), and more recently, the Lexical Quality Hypothesis (Perfetti & Hart, 2001; 2002; Perfetti, 2007), propose that difficulties in comprehension partly arise from poor word identification skills and weak representational links between a word's form (spelling and pronunciation) and its meaning. These theories are supported by correlational data indicating that word knowledge is a critical predictor of reading ability (Dixon, LeFevre, Twilley, 1988; Ouellette, 2006; Patterson & Hodges, 1992).

Word knowledge (i.e., information about a word's form and meaning) that is fundamental to efficient word identification processes can be communicated in many different ways (e.g., in context, through dictionary definitions, explicit vocabulary instruction, etc). However, it is widely hypothesized that most words are acquired 'incidentally' during independent reading without the aid of explicit meaning information (e.g., Herman, Anderson, Pearson, & Nagy, 1987; Jenkins, Stein, & Wysocki, 1984; Nagy, Herman, & Anderson, 1985). Furthermore, this knowledge is hypothesized to be gained 'incrementally,' whereby information about a word's meaning along with information about its form is acquired through multiple and variable encounters in context. The notion of incremental learning is supported by empirical studies illustrating that word familiarity (estimated by written frequency counts and subjective ratings) is strongly correlated with the availability of meaning knowledge (Durso & Shore, 1991; Ince &

Christman, 2002; Shore & Durso, 1990; Shore & Kempe, 1999; Whitmore, Shore, & Hull Smith, 2004).

1.2.1 What is 'known' about a word?

One of the research questions addressed in the present study is how word meaning is acquired from context. Therefore, it is important to understand what readers learn from context. There are two main contrasting views about 'knowing' a word. One perspective assumes that words do not have a 'true' meaning, but rather are points along a dimensional semantic space that reflects a reader's history of all prior language experiences. In this view, the constraints operating on a word's proper use are determined by the frequency of its co-occurrence with other words. Thus, meaning retrieval depends on the word's present context in relation to the history of all other word experiences (Rapaport, 2005; McDonald & Ramscar, 2001). This approach to word meaning implies that vocabulary acquisition can be either a passive or an active process, whereby word meaning is defined by the word's position in a contextual semantic space.

This perspective of semantic representations has been implemented in linguistic tools like Latent Semantic Analysis (LSA; Landauer & Dumais, 1997) and Hyperspace Analysis of Natural Language (HAL; Burgess & Lund, 1997). However, empirical data do not strongly support this view of meaning. For example, Bolger, Balass, Landen, and Perfetti (2008) reported that learners are able to retrieve meaning information about a recently trained word that is not associated with any specific context in which that word had been experienced. In their study, learners generated meanings for learned words that were independent of the context in which they had been encountered. Meta-analyses of vocabulary learning studies further support these

findings (Fukkink & de Glopper, 1998; Swanborn & de Glopper, 1999;), implying that word representations are not completely context-dependent.

The second account of word meaning that is also consistent with empirical data assumes that semantic representations can be characterized by two distinct levels of word knowledge. The first level is a specific and 'definition-like' representation of a word's meaning delimited by a set of core meaning features that are characteristic of a particular word (Drum & Konopak, 1987). This level of word representation is context-independent in that it should become activated whenever a word is retrieved (e.g., Barsalu, 1982), and is referred to as *definitional* of a word (Chaffin, 1997). We refer to this type of knowledge as word-level semantic knowledge. The second level of word information reflects general meta-linguistic knowledge of the word's relationship to other words (e.g., co-occurrence) and extendibility of use in other contexts (Miller, 1999). This level of word representation is context-dependent in that it should become activated whenever a word is presented in any given context (e.g., Barsalu, 1982), and is referred to as *contextual* knowledge of a word (Chaffin, 1997; Miller & Charles, 1991; Miller, 1999). Words for which both definitional and contextual knowledge can be accessed are regarded as 'decontextualized' representations (Beck, McKeown, & Omanson, 1987; Dale, 1965; Drum & Konopak, 1987). Not all word representations are 'decontextualized'; in some instances, a word representation may reflect only one level of word knowledge or in other instances, the knowledge is partial and incomplete. Decontextualized word representations are context-independent and flexible; allowing the reader to have stable meaning knowledge that is easily accessed from orthography and phonology, and more general information about the word's constraint of use in multiple contexts. For example, using a primed lexical decision task, Whitmore et al., (2004) demonstrated that readers activate both definitional and contextual

information for very familiar words. Other evidence shows that definitional information for a word tends to be more readily accessible than contextual information (Ince & Christman, 2002). These results are consistent with the second view of word knowledge, namely that word representations consist of two levels of word information, and suggest that there is an underlying process that allows for both types of knowledge to be acquired from context.

1.3   THEORIES OF WORD LEARNING FROM CONTEXT

As mentioned previously, one salient feature of incidental vocabulary learning from context is that acquisition of word meaning is incremental. Word learning studies conducted with school age children and with adults have demonstrated that the knowledge gained about a previously - unknown word after a few contextual exposures is rarely complete (i.e., decontextualized), but rather partial (Daneman & Green, 1986; Jenkins, et al., 1984; Nagy et al., 1985, Herman et al., 1987; Schwanenflugel, Stahl, & McFalls, 1997; Swanborn & de Glopper, 2002). For example, van Daalen-Kapteijns and colleagues reported in studies with children (van Daalen-Kapteijns, Elshout-Mohr, & de Glopper, 2001) and adults (van Daalen-Kapteijns & Elshout-Mohr, 1981) that the quality of a decontextualized word representation improves with increasing experience in context.

Currently, there are two perspectives on how word knowledge accrues from context. One view supports the idea vocabulary acquisition is a learner-driven process requiring substantial cognitive resources to learn new meaning. The other approach assumes that word learning is a memory-based process that depends on individual contextual encounters (instances) with words.

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1.3.1 Active Learning Approach

The active learning approach first endorsed by McKeown (1985) and similarly by Fukkink (2005) suggests that vocabulary acquisition entails readers actively dedicating considerable attentional and cognitive resources (e.g., working memory) to learn a word's meaning with each encounter in context. McKeown (1985) identified a series of cognitive processes required to derive a meaning from context and verify it in new contexts. These processes require learners to attend to the unknown word, search for contextual cues to derive its meaning, retrieve these cues when a new context is encountered, and evaluate the validity of the generated meaning in the new context.

Fukkink (2005) identified these same cognitive processes, but illustrated that readers use them flexibly rather than in sequence. He argued that readers engage in a general process of generating plausible meanings for words and testing these meanings in new contexts. This process has been referred to as "hypothesis-testing" whereby readers attempt to generate hypotheses about the meaning of an unknown word, and later confirm or generate new hypotheses when these words are again encountered in new contexts. For example, van Daalen-Kapteijns and colleagues (van Daalen-Kapteijns et al., 2001; van Daalen-Kapteijns & Elshout-Mohr, 1981) and others (Daneman & Green, 1986) have demonstrated that when learners are exposed to unknown words in multiple passages, they initially generate a plausible meaning for the word based on the first exposure, and later confirm the validity of this meaning in subsequent contexts. In this way, a word's meaning is confirmed, refined, or discarded when a new context is encountered.

The use of such an active learning strategy has been illustrated only in studies in which learners were given an explicit task to "derive" the meanings of unknown words. Deriving a

word's meaning involves a direct learning goal of attempting to extract meaning from context. If incidental learning is the more typical situation, derivational tasks do not simulate this because they have an explicit learning goal. Meta-analyses of derivational (Fukkink & de Glopper, 1998) and incidental (Swanborn & de Glopper, 1999) learning studies indicate greater gains in word knowledge for derivational learning tasks than for incidental learning tasks. These findings suggest that effortful cognitive processing results in higher knowledge gains, but that effortful processing may not occur unless there is an explicit learning goal.

1.3.2   Passive Learning Approach: Instance-based Learning

An alternative approach to vocabulary acquisition assumes that learning from context is a passive memory-based process rather than an active learner-driven process. Like the mechanism implemented in LSA and HAL, learning from context in this framework is driven by a passive resonance process in which word meaning is acquired from information that is repeated across individual instances of word use. Multiple models (e.g., Ans & Carbonnel, 1998; Goldinger, 1998; Johnson, 2006; Reichle & Perfetti, 2003) have implemented a passive resonance mechanism to explain effects of word reading and lexical access. In particular, Reichle and Perfetti (2003) have demonstrated that an instance-based resonance mechanism can account for both word frequency and regularity effects in native English speakers. Such a mechanism makes useful predictions about the effects of word experiences on learning word meaning, specifically, about the effects of quantity (frequency of exposure) and the quality of word use (type of context). Recently, Bolger et al. (2008) have demonstrated that an instance-based model can account for the effects of sentence contexts and dictionary definitions on the acquisition of meaning.

According to the instance-based learning framework (Reichle & Perfetti, 2003), each encounter with a word is encoded in specific episodic traces in memory that preserve all the properties comprising the experience. When a learner attends to a word, information about the word's basic features (e.g., spelling, pronunciation, and meaning) as well as contextual features are encoded in memory. Each encounter with a word will give rise to its own set of episodic traces, no matter how similar the encounter may be to a previous encounter with that same word. As a result, aspects of the encounter that are attended to and that recur will be represented repeatedly in memory. Repeated meaning and contextual features that are represented in multiple episodic traces will become stronger with each encounter. Contrastingly, context-specific features that are variable across multiple encounters will not be strengthened. Eventually, this process creates a set of unified traces that become characteristic of a word's core meaning along with a set of contextual features with which a word tends to co-occur frequently. Like other episodic memory models, (e.g., MINERVA 2; Hintzman, 1986) information retrieval in this instance-based model is mediated via a resonance mechanism. Specifically, resonance refers to the process of activating encoded episodic traces in memory when a word is encountered in context. For example, if the word has been encountered frequently in a variety of contexts, subsequent new encounters with the word will resonate (activate) with former episodic traces that have been encoded from previous encounters. Thus, this resonance process facilitates the activation and the retrieval of stored episodic traces from memory.

The conceptualization of a passive memory-based resonance mechanism as implemented by Reichle and Perfetti (2003) accounts for several word learning phenomena. For example, the model explains the acquisition of different levels of word knowledge (definitional and contextual) with a context-dependent learning process and an 'abstraction' process that allows

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context-independent knowledge to emerge. More importantly, this model accounts for incremental learning from context via a single mechanism, rather than separate active (e.g., McKeown, 1985) and passive processes (e.g., Landauer & Dumais, 1997).

The instance-based approach makes predictions about the effects of context on two important processes involved in learning; word familiarity (recognition) and meaning acquisition (abstraction). As pointed out by McKeown (1985), vocabulary learning requires learners to identify that they have encountered a word previously, and retrieve any associated meaning information for further verification. There are two important components that contribute to this first process; familiarity with word form (Cordier & Le Ny, 2005) and familiarity with meaning (Gernsbacher, 1984). The availability of both components is directly affected by the contexts in which a word has been encountered, and has implications for word identification during reading (Reichle, Rayner, & Pollatsek, 2003). Given that each instance with a word is encoded in memory, different contextual experiences will give rise to episodic traces of differing strength. The sum of these traces across all experiences for a particular word will affect how it is processed in a new context. Under the assumption that word familiarity (e.g., recognition) is affected by memory strength (Finnigan, Humphreys, Dennis, & Geffen, 2002), words that are represented with stronger memory traces will seem more familiar than words that are represented by weaker memory traces. Furthermore, the information that is abstracted and retrieved about a word's meaning will depend on the features that have been repeated or strengthened in multiple contextual episodes. Thus, different properties of contextual experiences will affect these recognition and abstraction processes. The instance-based model makes some general predictions regarding the effects of different contextual properties (e.g., type, variability, and semantic constraint) on learning word meaning.

1.4   CONTEXTUAL PROPERTIES OF WORD EXPERIENCE

1.4.1   Context Type

As mentioned earlier, there are many ways in which word meaning can be communicated. Words can be learned explicitly in contexts that directly convey core-meaning features (e.g., dictionary definitions) or implicitly in sentence contexts that indirectly express meaning. A definition can be considered a type of context because it provides a constraint on word meaning as do sentence contexts and passages. However, some researchers consider definitions to be very poor contexts because they lack information about word use. For example, in her analyses of definitions, McKeown (1993) reported that dictionary definitions tend to be abstract, generalized, and fragmented. Learning from definitions is often unsuccessful because learners often fail to recall the meaning of the word or are unable to apply the information to new contexts (e.g., using the word in a sentence). From an instance-based perspective, differences in learning words presented with definitions versus in sentence contexts can be explained by the episodic traces that are encoded when a definition is encountered. An experience with a definition will establish weak episodic traces that will activate many features in memory. For example, the definition of the word *vacuous* is "devoid of matter, empty, stupid, lacking serious purpose" (American Heritage Dictionary, 2000). These four meaning features for the word will be encoded in memory and will resonate with many other features. The meaning feature 'empty' will activate words that may not be related to the meaning of *vacuous*, such as 'glass', 'bottle', 'trash', and other concepts that can be empty. For example, a learner who studied the word with a definition, generated the following sentence for the word *vacuous*: The glass was *vacuous* because I was thirsty and I drank all the Gatorade" (Nist & Olejnik, 1995).

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This broadly-distributed activation of weak episodic traces impacts processing when the word is encountered in a new context. Specifically, it activates meaning features that may not be related to the word, and it also affects a reader's ability to retrieve definitional information. Balass, Bolger, Landen, and Perfetti (2006) demonstrated that weak memories of definitions fail to facilitate learning when a word is encountered in a sentence context. Compared to definitions, sentence contexts contain propositional and referential contents that may support encoding, whereas definitions lack this information. As a result, sentence contexts tend to be more specific (and possibly stronger) in their activation of word-related memories. Therefore, the first hypothesis tested in the present experiments was that the type of context (sentence versus definition) in which a word had been encountered would result in episodic traces of differing strength and distribution. Specifically, we predicted that definitions would be encoded in a broader and a weaker distribution of episodic traces than sentences, thus, affecting both familiarity and meaning acquisition processes. This hypothesis was tested by exposing adult learners to unknown words using dictionary definitions or sentences in four learning trials.

1.4.2 Contextual Variability

The instance-based framework can also explain differences in learning when the sum of all contextual experiences is considered. Under the assumption of incremental learning, multiple and varied contexts allow for the abstraction of meaning to occur. Bolger et al. (2008) tested this assumption by exposing learners to unknown words in varied contexts versus the same repeated context in four learning trials. Learners were more accurate in providing a word's meaning when it was encountered in varied contexts than in same repeated context. From the instance-based learning perspective, varied contexts provide more contextual features that are likely to be

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repeated across different encounters, thus facilitating the emergence of word-level semantic knowledge for a word. In contrast, a single repeated context will probably facilitate the emergence of only partial word-level semantic knowledge for a word because it provides fewer contextual features, and these features may reflect only one aspect of the word's meaning (e.g., Beck, McKeown, & McClasin, 1983).

However, contextual variability may not always facilitate better learning, especially in the case of word familiarity. Varied contexts do provide more features in memory, but each encoded feature will be weaker for not having been repeated. Contrastingly, a single repeated context provides fewer features, but each feature will be stronger for having been repeated. This suggests a possible interaction between the sum and strength of episodic memory traces and word familiarity. From a memory-based approach, memory strength facilitates recognition (Finnigan et al., 2002). Based on this view, words that have been experienced in a single repeated context should be more familiar because the same features are strengthened in multiple learning encounters. The alternate view (e.g., Gernsbacher, 1984) argues that familiarity is based on the availability of two components; form and meaning, where meaning is likely to be learned better from varied contexts than from a single repeated context. Specifically, varied contexts facilitate the abstraction of meaning features to a greater extent than a single repeated context. As a result, a wider, more diffuse distribution of episodic traces of form and meaning may account for familiarity. Thus, the second hypothesis to be tested in the proposed experiments is that contextual variability has differential effects on recognition processes and meaning acquisition, such that varied contexts allow for the abstraction process to occur, but a single repeated context strengthens episodic traces. To test the effects of contextual variability on

learning, learners were exposed to single sentence contexts that varied in content or that repeated the same content over four learning trials.

1.4.3 Semantic Constraint

Along with context type and variability, within-context features also determine the probability that a word's meaning will be learned. For example, Beck et al. (1983) illustrated that contexts are rarely directive of a word's meaning. The probability that a word can be learned with one exposure is increased if the sentence context contains one or more meaning cues (Sternberg & Powell, 1983). One way to determine the availability of cues or the 'directedness' of a context is to measure contextual semantic constraint. Specifically, semantic constraint refers to how well a particular context delimits the intended meaning of a target word. Daneman and Green (1986) showed that the quality of word-level semantic knowledge is affected by differences in contextual semantic constraint. They presented readers with passages that highly constrained the intended meaning of an unknown word. The results illustrated that the degree of constraint was significantly correlated with learners' ability to produce a near-synonym for the target word. Similarly, Bolger et al. (2008) assessed the quality of context by measuring contextual semantic constraint directly in a cloze-task procedure. They observed a significant positive relationship between the degree of semantic constraint of a sentence and learners' performance on generating a correct meaning for a target word.

Chaffin, Morris, and Seely (2001) reported that learners may use different encoding (learning) strategies when they encounter high versus low constraint sentences. Specifically, they presented learners with high and low constraint sentences using an unfamiliar pseudoword, and monitored their eye-movements as they read the sentences. Sentences were constructed such that

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in the first sentence the pseudoword was followed by an informative context that allowed the reader to infer the meaning of the word. This sentence was then followed by a second sentence in which the pseudoword was referred to by a synonym. For example, in the high constraint condition, participants were presented with, '*Joe picked up the* **asdor** *and began to strum a tune. He played the instrument to relax'*. In the low constraint condition, participants read, '*Joe picked up the* **asdor** *and started to walk home. He played the instrument to relax*'. In the high constraint condition the total gaze duration for the synonym (i.e., instrument) and for a control word did not differ, suggesting that readers already inferred the meaning of the word before reading the second sentence. Furthermore, readers showed longer overall sentence reading times in the high constraint condition than the low constraint condition. Using a similar learning paradigm, Williams and Morris (2004) found that sentence reading times were positively correlated with meaning knowledge.

The results from these eye-tracking studies suggest that readers infer the meaning of a word when that word is encountered in a highly constraining context. In terms of the instance-based learning framework, these contexts allow for the encoding of a word's meaning features along with contextual features. For low constraint sentences, this inference may not occur, but all other aspects of the encounter would be encoded in memory. In terms of encoded features, high constraint sentences will be encoded with additional meaning features that are inferenced (activated) when a word is encountered. Chaffin (1997) suggested that there is an attentional shift to infer an unknown word's meaning, especially when highly constraining contexts facilitate this process. Evidence for this attentional shift was supported in two studies indicating longer reading times for high constraint sentences than low constraint or neutral sentences (Chaffin et al., 2001; Williams & Morris, 2004). These data imply that greater cognitive effort is

involved in processing highly constraining sentences. This further indicates differences in depth of encoding (e.g., Craik & Tulving, 1975) between high and low constraint contexts. Deeper encoding implies stronger memory traces for high constraint contexts than low constraint contexts. Specifically, these encoded traces may be privileged in memory (e.g., strengthened) because of greater cognitive effort. For example, Stahl and Fairbanks (1986) and Daneman and Green (1986) illustrated that when the number of word exposures is controlled, words that are deeply encoded in more constraining contexts are recalled more accurately than words that are encoded in less constraining contexts. Thus, the third hypothesis to be tested in the current experiments is that the degree of semantic constraint of a context affects the encoding of a word's meaning, such that high constraint sentences will facilitate the process of encoding and inferring meaning from context, and thus, will lead to better learning of meaning. Furthermore, to the extent that word familiarity is affected by strength and/or the sum of encoded traces, words that have been encountered in highly constraining contexts will be more familiar than low constraint contexts. To test the effects of semantic constraint on learning, learners were exposed to single sentence contexts that were of high or low semantic constraint over four learning trials.

1.5   ERPS AND WORD LEARNING

Based on the assumptions made by the instance-based framework, word experiences will affect meaning acquisition and processing of subsequent encounters with a word. Along with behavioral measures that can reveal whether word meaning has been learned, the use of ERPs in word learning paradigms can offer additional information on the consequences of word experience on the time course of word identification and meaning retrieval.

Several studies have indicated the benefits of using ERPs to examine learning (Key, Molfese, & Ratajczak, 2006; McCandliss, Ponser, & Givon, 1997; Perfetti, Wlotko, & Hart, 2005), recognition (Curran, 1999; Finnigan et al., 2002; Wilding & Rugg, 1997), and meaning processing (Bentin, Mouchetant-Rostaing, Giard, Echaillier, & Pernier, 1999; Kutas & Hillyard, 1980). This previous research has identified several ERP components correlated with learning. One group of related ERP components, that are thought to index 'old/new' effects have been implicated in recognition processes. The other ERP component of interest, the N400, reflects meaning retrieval and integration processes.

1.5.1   Old/New ERP Effects

Two topographically distinct ERP components, the FN400 and the P600, have been implicated as markers of familiarity and recognition in 'old/new' word recognition paradigms (Curran, 2007). Generally, results show that ERPs evoked by learned (i.e., old) words are more positive in amplitude than ERPs evoked by untrained (i.e., new) words. The first component, the FN400 is a negative-going waveform with a medial-frontal electrode distribution that is elicited approximately 300 to 500 milliseconds after the onset of a word. Curran (2007) reported greater positive amplitudes for studied 'old' words than for 'new' words that were not studied during learning.   It is hypothesized that familiarity as indexed by the FN400 is more than an orthographic familiarity effect. Specifically, the FN400 old/new effect was also observed for new items that shared semantic features (i.e., synonyms) with old studied items. These items were referred to as 'lures' and elicited similar positivity as the 'old' studied items. Finnigan et al. (2002) observed that the FN400 old/new effect is also modulated by repetition and memory strength.   In this study, words were presented once (weak condition) or three times (strong

condition) during the study phase. ERPs evoked by words in the strong condition elicited greater positive amplitudes (a reduction in negative amplitude) at about 400 milliseconds than words in the weak condition. According to the instance-based learning approach, repetition strengthens episodic memory traces; therefore, the FN400 may also index memory strength as well. Other studies have also indicated that memory strength can be modulated by repetition (e.g., Gonsavles, Kahn, Curran, Norman, & Wagner, 2005). Thus, in the present experiments, the FN400 may be able to index the dissociation between unfamiliar (new) items and familiar (old) items, and the dissociation in memory strength as a consequence of repetition (i.e., in the varied contexts versus single-repeated contexts).

The second component, the P600 old/new effect, is a positive-going waveform with a centro-parietal electrode distribution that appears around 500 to 800 milliseconds after the onset of a word. The P600 behaves like the FN400, in that it is characterized by greater positive amplitudes for old items than for new items (Curran, 1999; Curran, 2007). However, unlike the FN400, the P600 is modulated by recollection processes rather than by familiarity. Rugg, Allan, and Birch (2000) reported greater positive amplitudes around 600 milliseconds for old studied items than for new items that were not presented in the word study phase. Curran (2007) reported that the P600 amplitude indexes the recognition of recollected word representations that have been recently experienced, (studied items versus unstudied items), rather than a familiarity-driven recognition process that may be also modulated by the presence of semantic knowledge. Therefore, the presentation of semantically related lures does not elicit greater P600 amplitudes.

Rugg et al. (2000) reported that P600 amplitudes are modulated by depth of encoding rather than by simple repetition that may increase overall memory strength for the item. They further observed that amplitudes for old items were graded as a result of depth of processing. In

the learning phase, participants engaged either in a deep or shallow study task. For the deep task, learners studied each word and incorporated it into a meaningful sentence. For the shallow task, learners judged whether the first and last letter of each word was in alphabetical order. P600 amplitudes for deeply studied words were more positive than for shallow studied words.

The P600 old/new effect has also been directly observed in word learning studies. For example, Perfetti et al. (2005) exposed learners to the form and meaning of rare unknown words. They reported a positive component at approximately 500 milliseconds (P600) after the presentation of word that separated learned words from untrained and familiar words. Balass, Nelson, and Perfetti (2010) observed similar P600 effects. In their study however, learners were exposed only to two of three constituents of a word (i.e., spelling, pronunciation, and meaning). Learners were exposed to unknown words in three conditions: orthography-meaning (OM) condition in which they saw the spelling of the word and learned its meaning; orthography-phonology (OP) condition in which they heard the word and saw its spelling; and the phonology-meaning (PM) condition in which they heard the word and learned its meaning. Balass et al. replicated the reported finding for the P600 old/new effects; a separation between trained 'old' words (OM, OP, and PM) and untrained rare 'new' words was observed. More interestingly, they also found that the type of training modulated the P600 effect for 'old' trained words. OM words elicited the largest positive P600 amplitude, which was significantly different from the P600 amplitudes for OP and PM words. The OM condition in this study was the 'deeper' training condition, because it had an orthographic familiarity advantage that the PM condition did not. This finding suggests that the depth of learning affected subsequent recognition of these trained words (see Figure 1).
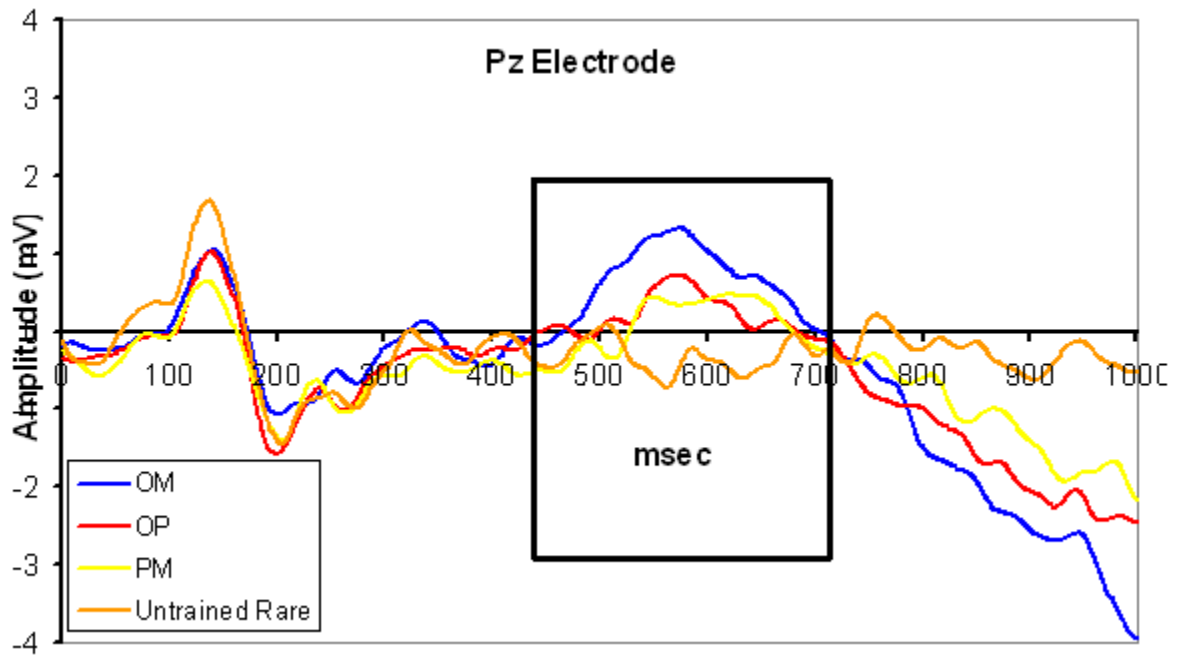
Figure 1: P600 old/new effects illustrating depth of learning

Nessler, Mechlinger, and Penny (2001) point out that depth of encoding impacts recognition processes for words that have not been directly learned, but that have been activated during learning. In their learning paradigm, Nessler et al. asked one group of participants to assign nouns to specific categories (category group), and another group to judge whether a noun represented an animate or inanimate object (items group). When participants were tested on these words, they were presented with old nouns that were studied (old), new nouns drawn from non-studied categories (new), and new words from the studied categories (lure). Nessler et al. hypothesized that because the category-encoding task facilitated 'lure' items to be activated, P600 effects should be observed for these new items. Contrastingly, because the item-encoding task does not allow for this type of activation, no difference was expected between 'new' items and 'lure' items. Both hypotheses were confirmed. For the category study group, the P600 differentiated 'old' and 'lure' nouns from 'new' nouns. And, for the item study group, the P600 differentiated 'old' nouns from 'lure' and 'new' nouns. These results suggest that P600 effects

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are sensitive to activation of meaning-related information during learning; this may be especially relevant for examining the effects of high and low constraint contexts. For example, Mestres-Misse, Rodriguez-Fornells, and Munte (2007) trained their learners using single sentences of high and low semantic constraint. Their learners elicited a more positive P600 for words learned with high constraint sentences than for low constraint sentences. Learners are more likely to activate meaning-related information of the target word in a high constraint sentence that is supportive of the word's meaning than in a low constraint sentence that is less supportive. Thus, for the present experiments, the P600 old/new effect may index differences in recollection of 'old' and 'new' items, and the effects of depth of processing as a result of differences in sentence quality (i.e., high constraint versus low constraint sentences).

1.5.2   Meaning Acquisition Effects: N400

The N400 component is related to meaning processing. Not to be confused with the FN400 old/new (memory strength) effect, the N400 is also a negative-going waveform that appears around 300 to 500 milliseconds after the onset of a word. Unlike the FN400 however, its distribution is at central and parietal sites. The N400 has been implicated in many tasks requiring semantic processing. Generally, the N400 reflects meaning congruence between a word and its previous context. It has been implicated in both sentence context presentations (Kutas & Hillyard, 1980) and single word semantic priming presentations (Nobre & McCarthy, 1994). When a word is incongruent with its context it produces a negative-going wave peaking at about 400 milliseconds after the onset of a word; a congruent word produces a reduced N400 effect (less negative amplitude). Perfetti et al. (2005) reported N400 effects related to meaning acquisition. Following word training in their study, learners were presented with the trained

words followed by meaning probes that were related or unrelated to the words' meanings. They observed robust N400 effects for unrelated meaning probes and a reduction of the effect for related meaning probes. The presence of the N400 effect for unrelated probes indicated that participants learned the meanings of the words.

Bolger, Yang, Taylor, and Perfetti (2007) observed similar effects when words were learned with single context sentences and dictionary definitions. They presented learners with four sentence contexts with an embedded unknown word; the contexts either varied in content (varied condition) or repeated the same content (repeated condition). Meaning acquisition from context sentences was contrasted with learning with dictionary definitions. During testing, learners were presented with single sentence contexts that were congruent or incongruent with the trained words' meanings. Bolger et al. observed an N400 reduction for sentences that were congruent with a word's meaning for the repeated and varied context conditions. Repeated contexts had a slightly smaller N400 reduction for congruent sentences than for incongruent contexts. This suggests that learners were able to acquire partial definitional and contextual information from a single repeated context. However, words learned with a dictionary definition did not show a similar N400 pattern for congruent sentences. No differences were found between N400 effects for congruent and incongruent sentences. This result corresponds with behavioral findings that illustrate dictionary definitions to be unreliable in providing information about word use (McKeown, 1993).

Mestre–Misse et al. (2007) reported similar N400 effects for high constraint and low constraint sentences. Following learning, participants were presented with learned words followed by meaning probes that were related or unrelated in meaning to the learned words. For words that were learned with high constraint sentences, Mestre-Misse et al. found a large N400

effect for unrelated meaning probes and a reduction of the effect for related meaning probes. In the low constraint condition, N400 effects were not reduced for related meaning probes, indicating that learners did not learn the meaning of the words in the low constraint condition. Thus, for the present experiments, the N400 may index differences in meaning acquisition as a result of word experience, specifically, differences in type (i.e., definitions versus sentence contexts), in variability (i.e., varied contexts versus single repeated contexts), and semantic constraint (i.e., high constraint versus low constraint).

1.6   INDIVIDUAL DIFFERENCES

General differences in reading ability and working memory contribute to differences in vocabulary acquisition from context (Cain, Lemmon, & Oakhill, 2004; Curtis, 1987; Jenkins et al., 1984; McKeown, 1985). McKeown (1985) and van Daalen-Kapteijns and Elshout-Mohr (1981) found that more-skilled readers were better able to make use of a context to generate hypotheses about word meaning than less-skilled readers. As a result, more-skilled readers showed greater gains in meaning knowledge than their less- skilled counterparts. Daneman and Green (1986) demonstrated that working memory also contributes to differences in word learning. They found that receptive and productive working memory span reliably predicted learning from context. Measures of reading skill and working memory capacity are typically correlated (Dixon, LeFevre, & Twilley, 1988). For example, comprehension tests for adults (e.g., Nelson-Denny Comprehension Test; Nelson & Denny, 1973) measure both reading accuracy and reading speed; this latter measure incorporates a component of verbal working

memory span. Furthermore, Cain, Oakhill, and Lemmon (2004) demonstrated that both reading skill and working memory capacity are reliable predictors of word learning ability.

Perfetti et al. (2005) reported ERP effects reflecting differences in comprehension skill and word learning are detectable in ERPs. In their study, more-skilled readers learned more words and showed stronger P600 effects (i.e., greater amplitudes) for trained words than less-skilled readers. More-skilled readers also showed superior performance on meaning judgments than less-skilled readers. Perfetti et al. (2005) attributed these differences in learning to differences in the process of encoding episodic traces. More-skilled readers may make better use of their experiences with words, and as a result, their better word learning performance may be attributed to stronger episodic traces that include stable form and meaning information of a word. For the present experiments, individual difference measures (lexical quality, vocabulary, comprehension, and working memory) were used to test a general hypothesis that differences in working memory and comprehension skills give rise to differences in word learning, and that these differences would be detected in both behavioral and ERP measures.

1.7 PRESENT EXPERIMENTS

The present experiments test the general hypothesis that differences in word experience affect meaning acquisition and word familiarity. According to the instance-based learning model (Reichle & Perfetti, 2003), differences in word experience give rise to differences in episodic memory traces that are encoded at learning, thereby affecting word learning outcomes. From this, three specific predictions about three word experience factors, i.e., context type, contextual

variability, and semantic constraint, were tested in an incidental word learning paradigm. These predictions are as follows:

(1) The context type (definition or single sentence context) in which a word has been encountered will give rise to episodic traces that differ in strength, and this will affect familiarity and meaning acquisition. This prediction is tested in Experiment 1.

(2) Contextual variability (varied content or same repeated context) will affect the strength of memory traces encoded at learning, thereby having differential effects on word recognition processes and meaning acquisition. This prediction is tested in Experiment 1 and 2.

(3) Semantic constraint (high constraint or low constraint) of a single sentence context affects the encoding of a word's meaning, thereby resulting in differences in meaning acquisition which in turn, affect word familiarity. This prediction is tested in Experiment 2.

2.0   EXPERIMENTAL PRELIMINARIES

2.1   OVERVIEW

The goal of the present experiments is to test several hypotheses about the effects of learning words in single sentence contexts on meaning acquisition. One important factor that contributes to differences in meaning acquisition from context is semantic constraint (Chaffin, et al., 2001; Daneman & Green, 1986; Williams & Morris, 2004). Bolger et al. (2008) used a four trial incidental learning paradigm and showed that semantic constraint is positively correlated with meaning acquisition. However, in their experiment, semantic constraint across the four learning trials was not directly controlled for; as a result, semantic constraint scores within a set of four trials ranged from low to high. To test directly the effects of variability and semantic constraint, it is critical that the semantic constraint scores of single context sentences within a set of four learning trials be controlled. In this way, hypotheses concerning main effects and interactions of variability and semantic constraint can be addressed directly.

For this normative experiment, single sentence contexts of low, medium, and high semantic constraint were generated for 120 rare English words. Medium semantic constraint sentences were also generated for the ERP testing portions of the experiments. Semantic constraint scores for the sentences were measured using a cloze-task procedure. Given the

volume of sentences required for the experiments, a crowdsourcing tool (Amazon Mechanical Turk) was implemented to collect the normative data efficiently.

2.2   METHODS

2.2.1   Amazon Mechanical Turk

The learning paradigm used in the present experiments required a set of 12 sentences for each target word (four sentences for each semantic constraint range; low, medium, and high). A total of 120 words were used in each learning experiment, thus a total of 1440 sentences were needed. To test the hypotheses about semantic constraint and meaning acquisition, these sentences were normed using a cloze task to attain a semantic constraint score for each sentence. To norm these sentence efficiently and cost-effectively, the Amazon Mechanical Turk system (www.mturk.com; AMT) was employed as a crowdsourcing tool to collect these semantic constraint data. AMT is an online labor market in which workers are paid small amounts of money (e.g., 0.02 dollars) to complete simple tasks. The system is designed that any individual can create an account as a requester or a worker. Workers are anonymous, and are assigned a worker identification number. A requester can create simple tasks to be completed (e.g., a sentence cloze task), and set the criteria for the task. For example, a requester can assign a single cloze sentence to be completed by ten different workers. Each time a requester creates a task, he or she may restrict the availability of the task to a unique set of workers who have not completed the task previously. This option was helpful to minimize workers completing the same task twice.

AMT provides the requester with an excel sheet with the workers' identification numbers, time in seconds in which the worker completed the task, and response for each task that has been completed. If the worker has not completed the task satisfactorily, the requester can deny payment or request that the worker complete the task again. AMT has been shown to be a useful tool to collect natural language data (e.g., Munro, Bethard, Kuperman, Lai, Melnick, Potts, et al., 2010; Nikolova, Boyd-Graber, Fellbaum, & Cook, 2010; Parent & Eskenazi, 2010; Snow, O'connor, Jurafsky, &, Ng, 2008).

Each single sentence used for the learning and testing portions of the experiments was normed using ten AMT workers using a cloze task procedure. Along with the 1440 sentences used in the learning paradigm, an additional 120 medium constraint sentences were created for the testing portion of the experiments. Each worker was paid 0.02 dollars for each sentence completed. Blank responses or inappropriate responses were rejected. The sentences had to fit semantic constraint criteria (described below); thus, many of the sentences had to be revised and re-normed until their semantic constraint scores were within the required range.

2.3   MATERIALS

2.3.1   Words

A total of a 120 low-frequency rare English words were chosen for Experiments 1 and 2. These words were selected from a norms database of over 500 rare English words that were rated for their orthographic and meaning familiarity among college-age students (Balass, 2007). Each word was rated on two different scales (one for meaning and one for orthographic familiarity

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ranging from 1 to 7): where 1 indicates completely unfamiliar, and 7 indicated very familiar. From this database, words were selected from the low end of the scales for orthographic and meaning familiarity; average familiarity scores ranged from 2 to 3. The mean orthographic and meaning familiarity scores for these words were 2.61 and 2.22, respectively.

Very rare words, those with orthographic and meaning scores of less than 1.5 were not chosen for the present experiments. These words tend to have inflexible meanings, e.g., *croosle* which means a low whimper, specifically one that is produced by infants. Words that fit this category of 'very rare words' cannot be used in a variety of contexts, thus, restricting their usability, especially for the purposes of the current studies.

The words selected for the present experiments were balanced for part of speech and number of letters. None of the words that were chosen from each part of speech were semantically ambiguous. For the 120 target words (40 adjectives, 40 nouns, and 40 adjectives), the mean word length was 7.83, with a range of 4 to 11 letters. The number of letters per word across part-of-speech (nouns 8.15, with a range of 4 to 11 letters, verbs 7.43 with a range of 5 to 10, and adjectives 7.93, with a range of 5 to 11 letters) did not differ statistically (F (2, 120) = 2.35, p = .10). Of the 120 words, only 27 appeared in the Kucera-Francis (1967) word norms. For these words, the average frequency was 1.56 occurrences per million.

2.3.2   Definitions

For each target word, four dictionary definitions were selected from various dictionaries (e.g., Merriam-Webster, American-Heritage, Cambridge, Hutchinson Dictionary of Difficult Words, and Wordsmyth English Dictionary). For words with multiple senses, one sense of the word was selected and used consistently. All dictionary definitions were balanced for their length and

number of critical meaning features (Miller, 1990). Specifically, features in this case referred to the number of words that defined the meaning of the word. For example, the word *abjure* can be defined by three meaning features, '***recant***', '***renounce***', and '***publically***', alternatively, the word '*lassitude*' can be defined by five meaning features, '***weariness***', '***diminished***', '***energy***', '***tired***', and '***lethargy***'. To control for learning differences due to the number of meaning features, the number of critical meaning features for each word was restricted to a range of two to three.

2.3.3 Sentences

For each target word, a set of 12 learning sentences was generated (four for each level of constraint). Semantic constraint was defined as the extent to which a particular sentence context supported the underlying meaning of the target word. The constraint score for each sentence was determined using a cloze task procedure, as described below. Semantic constraint scores ranged from 0 to 1, where a score of 0 indicated a very low constraint sentence and a score of 1 indicated a very high constraint sentence. Using predetermined criteria, constraint scores for low constraint sentences were lower than 0.3, medium constraint sentences ranged from 0.3 to 0.6, and high constraint sentences were higher than 0.6.

The experimenter generated all experimental sentences; the context of each sentence was consistent with the word's critical meaning features as defined by the word's definition. Regardless of the intended constraint of a sentence, no word that appeared in the word's definition was repeated in any of the sentences. As described previously, each sentence was presented to a unique group of ten registered AMT workers. Each worker was presented with a

single sentence in which the target word was replaced by a blank. The workers' task was to generate a single word that would best fit the context of the sentence.

Given that the target words were of very low frequency, workers rarely generated the exact word that had been removed from the sentences. Thus, to evaluate the semantic fit of the words that the workers generated, an alternative method of scoring was used (Bolger, 2008). Each target word was defined by a set of synonyms derived from the Merriam-Webster Thesaurus. These synonyms were 'first-order' synonyms and were directly related to the word, such that they captured all the meaning features that defined the target word. For example, for the word 'abjure' (meaning to retract or renounce under oath), its first order synonym is 'recant'. Some of the generated responses did not fit the category of first-order synonyms, but were still semantically related to the target word. These words were classified as 'second-order' synonyms, and they captured only some of the meaning features that defined the target word. For example, the word 'back-down' only captures one of the meaning features of the word 'abjure'. Each generated response was assigned one of three scores (1, 0.5, or a 0). If the response that was generated was a first-order synonym of the target word, that response was assigned a score of 1 (e.g., recant for 'abjure'); if the response that was generated was a second-order synonym of the target word, (e.g., back-down for 'abjure'), then that response was assigned a score of 0.5. Responses that were semantically unrelated to the target word were assigned a score of 0. The rated scores were averaged for each sentence, thus resulting in a semantic constraint score that ranged between 0 and 1. Bolger et al., (2008) illustrated that this method of scoring is effective for measuring the semantic constraint of sentences where the intended word is of low frequency.

In addition to a semantic constraint score, a uniqueness score was computed for each sentence. Specifically, for any set of responses for a particular sentence, the number of tokens (i.e., unique responses) was counted. The total number of tokens was then divided by the total number of responses for the sentence; thus resulting in a uniqueness score that ranged from 0 to 1. A low uniqueness score indicated lower response variability than a higher score. This measure was critical to determine if any of the context sentences were misleading (i.e., leading the learner to infer the wrong meaning for the word). For example, a low constraint and a low uniqueness score for a context sentence would indicate that the sentence was not supportive of the target word's meaning, and that it is misleading and supportive of another word. To ensure that the low constraint sentences were vague, rather than misleading in meaning, a uniqueness score threshold of 0.7 was used. In this way, the low constraint sentences were less constraining of the target word's meaning rather than possibly more constraining a different meaning.

2.4   RESULTS

To ensure that the semantic constraint scores differed significantly for each set of sentences, a constraint (low, medium, high) by context sentence (one, two three, four) ANOVA was completed for both constraint and uniqueness measures. A significant main effect of constraint was observed for both measures. A main effect of semantic constraint, $F(2, 100) = 1093.17$, $p < .01$ indicated significant differences in mean semantic constraint scores for low ($M =. 12$), medium ($M =. 41$), and high ($M = .72$) sentences. These means did not differ across context sentences, nor was there a significant interaction of semantic constraint and context sentence.

A main effect of uniqueness, F (2, 100) = 97.79, p < .01 indicated significant mean differences in uniqueness scores for low (*M* =. 83), medium (*M* =. 65), and high (*M*= .56) sentences. These means did not differ across sentences, nor was there a significant interaction of uniqueness score and context sentence.

These results illustrated that the intended semantic constraint manipulation was consistent across all four sentences for any given target word. Differences in uniqueness score means indicate that low constraint sentences were vague rather than misleading. Furthermore, lower uniqueness scores for high constraint sentences indicate less response variability, which would be expected for highly constraining contexts.

3.0   GENERAL METHODS FOR THE PRESENT EXPERIMENTS

3.1   OVERVIEW

Experiments 1 and 2 tested different predictions about word experience and word learning; however, the same learning paradigm and experimental tasks were used for each experiment. The following section describes the general procedures that were implemented in both experiments; the specific details for each experiment and the conditions that were manipulated are described in the sections that follow.

3.2   PARTICIPANTS

Learners for both experiments were recruited from a pool of approximately 750 college-age students from the University of Pittsburgh department of Psychology undergraduate participant pool. All participants in this pool completed a battery of tests assessing comprehension ability and lexical knowledge for course credit. These learners represented a broad range of ability on comprehension, vocabulary, and lexical skills. Participants' handedness was determined using a short questionnaire to assess their handedness preferences (only right-handed individuals were selected). Learners were paid a total of $40 to $45 for completing the approximately four-hour study that followed their participation in the assessment battery.

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3.3 COMPREHENSION, VOCABULARY, AND LEXICAL SKILL ASSESSMENTS

Learners completed a series of pencil and paper tests measuring, comprehension, vocabulary, lexical skill, and nonverbal intelligence. Each learner completed the following tests described below.

3.3.1 Lexical knowledge (orthographic, phonological, and semantic)

Learners' orthographic knowledge was measured with a spelling test. Learners were asked to judge which letter strings from a list of correctly (e.g., naive) and incorrectly (e.g., essense) spelled words were real English words. The test was scored according to the number of items selected correctly (i.e., hits, selecting that 'naïve' is spelled correctly) and incorrectly (i.e., false alarms, selecting that 'essense' is spelled correctly). Hits and false alarm rates were used to calculate a d-prime score (a sensitivity measure) for every learner. This test provided an approximate measure of participants' orthographic representations for high and low frequency words. The d-prime score was correlated with learners' performance on the wording learning tasks.

Phonological knowledge was assessed with two tests. In the first test, the Real Words Test, learners made decisions on which letters strings when pronounced aloud would sound like real English words (e.g., teech versus bape). This test was also scored according to the number of items selected correctly (e.g., hits, selecting that 'teech' sounds like a real word) and incorrectly (i.e., false alarms, selecting that 'bape' sounds like a real word). Hits and false alarm rates were used to calculate the d-prime score for every learner. This knowledge test provided a measure of participants' decoding ability. The d-prime score was later correlated with learners'

performance on the wording learning tasks. The second test, the PHaT, provides a measure of phonological awareness. For this task, learners were presented with a list of words for which they had to manipulate its phonemes. For example, for the word 'middle' they were required to remove the /d/ sound, and generate the word 'mill'. The test was scored for the accuracy of the generated words after the phoneme was removed.

Finally, semantic knowledge was assessed using the Nelson-Denny Vocabulary Test. Learners were presented with high and low frequency target words and were asked to choose one word from five choices that fit the target words' meaning. Unlike the orthographic and phonological knowledge tests, this vocabulary test was a 7 ½ minute timed test. Participants received two scores on their performance; an accuracy score (how many items were answered correctly) and a speed score (how many items out of 100 were attempted). These two scores were combined into a composite vocabulary score; the number of correct items was subtracted from the number of attempted items, and then this number was multiplied by 0.20. A fifth of a point penalty was employed for every question that was answered incorrectly. This value was then subtracted from the total number of correct items; this yielded a final vocabulary composite score. Thus, the composite vocabulary score formula was: vocabulary score = number of correct items – (0.20*(number of attempted items – number of correct items)). This composite score provided information about learners' reliability and efficiency in accessing word meaning.

3.3.2   Comprehension

The Nelson-Denny Comprehension Test, Version E (Nelson & Denny, 1973) was used to measure comprehension. The test comprised eight passages of varying length (approximately 250 to 700 words) on different topics, and eight sets of multiple-choice questions (a total of 36

questions) that followed after each passage. This particular version of the Nelson-Denny test was also timed allowing participants 15 minutes to complete the comprehension assessment. For this test, accuracy and speed were also combined into a composite comprehensions score. The composite comprehension score formula was: comprehension score = number of correct items – (0.20*(number of attempted items – number of correct items)).

3.3.3   General Knowledge

In addition to comprehension and lexical skill assessments, participants completed two tests of general knowledge. The first was the author recognition test (ART). Participants were presented with a list of full names and asked to select names from the list that they know to be authors and/or writers of novels, short stories, magazine articles, etc. This test was intended to give an approximate measure of text exposure. Like the previous tests described, it was scored based on the number of items answered correctly ('hits') and the number of items answered incorrectly ('false alarms'). The validity of this test as an indicator of print exposure has been documented in several studies illustrating positive significant correlations between ART measures and orthographic processing (Stanovich & West, 1989), and general comprehension ability (West, Stanovich, & Mitchell, 1993).

The second test of general knowledge, Raven's Progressive Matrices, is a measure of non-verbal intelligence. Participants were presented with 12 test items; each test item is a three-by-three array of nine patterns with the ninth pattern omitted. Participants were asked to correctly identify the missing pattern required to complete the array from six possible choices. The items on the test progressively increased in difficulty, thus, each item required greater

cognitive processing than the previous item. The test was scored according to how many items were answered correctly.

3.4   PROCEDURE

Each experiment included three phases; working memory assessment, word learning, and word testing. Learners initially completed a working memory assessment including the reading span (Daneman & Carpenter, 1980) and operation span (Tokowicz, Michael, & Kroll, 2004) tasks. During the approximately hour-long learning phase, rare unknown words were presented to the participant in one of four different learning conditions on a computer screen using E-prime software from Psychological Software Tools, Inc. This was then was followed by the testing portion of the study which included testing of vocabulary knowledge from the word learning phase using three different tasks (semantic judgment, sentence judgment, and definition generation). Two of these tasks, the semantic judgment and sentence judgment tasks, included the recording of ERPs. The duration of the study in its entirety ranged between 4 and 4.5 hours. Each of these phases is described in the following sections according to task order within the experiment.

3.5   WORKING MEMORY ASSESSMENT

3.5.1 Non-Verbal Working Memory

For a measure of non-verbal working memory, learners completed the operation span test (OSPAN) (see Tokowicz, Michaels, & Kroll, 2004). The Ospan test requires learners to solve a series of simple mathematical operations while trying to remember a set of unrelated words. For this task, learners were presented with a mathematical operation (e.g., 8/2 -1 = 1) on a computer screen, and were asked to press the appropriate key if the answer provided to the operation was true or false. Immediately after, a word was presented on the screen that the learner needed to remember.

Operations and words were presented in increasing span sizes of two to six items, with the presentation of three sets per span size. Following the presentation of each span set, learners recalled the words that were presented, in the order in which they were presented. A total of 60 words and 60 mathematical operations were presented to the participants. We derived three working memory measures from the OSPAN task: the total number of words correctly recalled from the word memory task (total span), the set size span for which the participant correctly recalled all of the words for at least two of the three sets (set size span), and the total accuracy on the operations task. A criterion of 80% was set for the operations task to ensure that participants did not ignore the operations task in favor of the word memory task (Turner & Engle, 1989).

3.5.2 Verbal Working Memory

Learners completed the Reading Span Test (RSPAN: Daneman & Carpenter, 1980) to measure their verbal working memory span. The purpose of this test was to challenge both verbal processing capacity and storage of working memory. The test was modified from its original form, and was administered online rather than with an experimenter. Learners were presented with a set of sentences to read on a computer screen. At the end of each set they were asked to recall the final word of each sentence in the set. Like the OSPAN, sentences were presented in increasing span sizes of two to six items, with the presentation of three sets per span size. After reading each sentence, learners made decisions about the comprehensibility of the sentences. The presented sentences were either comprehensible (e.g., Rhonda missed her appointment because she was sick yesterday) or nonsensical (e.g., I always feed my socks when I wake up in the morning), and learners were asked to press the appropriate button to indicate the type of sentence. Following the presentation of all of the sentences in a set, participants recalled and typed the final words of the sentences, in the order in which they were presented, on a recall screen. We derived three measures from the RSPAN: the total number of words correctly recalled from the word memory task (total span), the set size span for which the participant correctly recalled all of the words for at least two of the three sets (set size span), and the accuracy on the sentence comprehensibility task. A criterion of 80% was set for the operations task to ensure that participants did not ignore the operations task in favor of the word memory task (Daneman & Carpenter, 1980).

3.6   LEARNING PHASE

3.6.1   Materials

The learning phase of the experiment included the set of 120 rare English words selected from Balass's (2007) rare word norms database. See the norms experiment for a description of these words. The target words were quasi-randomly assigned to four word learning conditions, thus resulting in 30 words (ten nouns, ten adjectives, and ten verbs) in each learning condition.

3.6.2   Design

For both experiments, a within-subjects 2 x 2 design was used. Experiment 1 investigated differences in word learning outcomes for context type (definition or sentence contexts) and variability (varied or repeated).   Experiment 2 investigated differences in word learning outcomes for semantic constraint (high or low constraint) and variability (varied or repeated). All words were learned with a total of four learning trials. Regardless of whether context type or semantic constraint was being manipulated, if the target word was assigned to a varied learning condition, a different single context sentence or dictionary definition was presented for each of the four learning trials. If the word was assigned to a repeated learning condition, the same repeated single sentence context or dictionary definition was repeatedly presented for all four learning trials. The methods below here refer to the general protocol that was used in both experiments regardless of which variables were being manipulated.

3.6.3 Initial Familiarity Check

Learners were presented with a total of 120 rare words, with 30 words assigned to each of the four learning conditions described below. Each learning session began with an initial word familiarity check to assess learners' previous familiarity with the rare words.

Each rare word was displayed on the screen for a total of 1 second, and the learner proceeded to respond whether it was familiar or unfamiliar by pressing the appropriate keys. A time limit of 1 second was imposed as the maximum decision time to ensure that learners made their responses quickly and uniformly without fixating on any given word. Words that were rated consistently as familiar were omitted from the final behavioral and ERP analyses. Words were presented in a random order.

3.6.4 Word Learning

After the completion of the familiarity check, the learning phase of the experiment began. Learners were presented with a total of 120 rare words, with 30 words assigned to each of the four learning conditions. Words were assigned to conditions in a quasi-random fashion to control for any possible confounds between learning conditions, part of speech, and word length. The rare words to-be-learned by participant were randomly divided into 4 lists; each list included an equal number of nouns, adjectives, and verbs (i.e., 10 of each), and the average word length was not statistically different across the four lists (F $(1,3)$ = .375, p= .771). To control for any list order and sequence effects, a balanced Latin square was used to counterbalance the learning conditions and the four word lists. This yielded four different versions of the learning

experiment. Each rare to-be-learned word was presented to the learner four times yielding a total of 480 learning trials.

The presentation of any given learning trial for a target word was such that each learning trial had to be followed by the next learning trial for a target word within 5 to 10 trials. Specifically, word order was random (any word could be selected from any of the conditions in any order), but after the presentation of the first learning trial for a given word, the subsequent second learning trial had to follow within 5 to 10 trials later, and then the third learning trial had to within 5 to 10 trials later then the second, and so on.

In both experiments, each word was presented either with a single sentence or a definition depending on the experimental manipulation. To control for the number of exposures to the word across all conditions, for all sentence trials, the word was replaced with a blank. In this way, for sentence trials, the word did not appear twice on the screen, and it matched the frequency of word presentation (i.e., one) for the definition trials.

Learners proceeded from one learning trial to the next by pressing a button. This portion was self-paced, thus, the learner could spend as much time as needed to read the definition or the sentence for any given word. The learning portion was completed until the learner was exposed to all 480 learning trials for the 120 words. This phase was approximately an hour long and was then followed by the testing phase of the experiment.

3.7   TESTING PHASE

After the completion of the learning phase (i.e., working memory assessment and word learning phase), the learners completed three tasks to assess their newly acquired knowledge of the words.

All participants completed a semantic-judgment task and a sentence judgment task while ERPs were recorded. This then was followed by a definition generation task. The testing phase of the experiment took approximately 2.5 hours to complete.

3.7.1   Semantic-Relatedness Judgment Task

Upon successful completion of the learning phase, learners completed a semantic-relatedness judgment task to test their newly-acquired word knowledge while ERPs were recorded. Participants were presented with a single word followed by a second word (a meaning probe) that was related or unrelated in meaning. They were asked to respond whether the two words were related in meaning by pressing a key. The presentation of the first word was either a word from the learning phase, a familiar low frequency word, or a rare untrained word. The meaning probe was semantically related to the first word ("YES" trials; *hebetude- boredom*) on half of the trials and unrelated to the first word ("NO" trials; *lassitude-excitement*) on the other half of the trials. The semantically-related meaning probes were created by the experimenter, and were not derived directly from the definition the participant studied during the learning phase; the experimenter explicitly avoided using any of the words used to define the word in the learning phase as related meaning probes. The semantically-unrelated pairs were created by shuffling the meaning probe word pairs and randomly making new pairings. After shuffling the words, the experimenter verified that the word pairings were unrelated. The order of the word pairs was randomized for each participant. Each learner completed a set of 180 trials while ERPs were recorded.

Each trial began with a fixation cross that appeared in the middle of the computer screen for 350 milliseconds. Following fixation, a blank screen was presented for a variable duration of

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50 to 250 milliseconds. The purpose of the variability in duration of the blank screen was to reduce any influence of non-stimulus related time-locked electrical activity. Following the blank screen, a prime word was selected randomly from the total set of words available for the task (a learned word from any of the four learning conditions, a familiar word, or an unfamiliar rare word). The first word was presented for 1000 milliseconds and was followed immediately by the meaning probe, which was presented for a maximum of 2000 milliseconds.

Learners were instructed to press the '1' key with their right index finger if the two words presented were related in meaning and to press the '2' key with their right middle finger if the two words were unrelated in meaning. The meaning probe word was removed from the screen when a response was made or if no response was detected after 2000 milliseconds had elapsed. Participants received feedback on the accuracy of their judgment for each trial. If the participant was correct, the word 'correct' appeared in green font color and the decision time were displayed on the screen for 2000 milliseconds before the onset of the next trial. If the response was incorrect, the word 'incorrect' in red font color was displayed with no decision time.

This task was designed to measure familiarity (i.e., NF400), recollection (i.e., P600), and meaning acquisition (i.e., N400) following the learning phase. ERPs were stimulus-locked to two events: the presentation of the first word (word 1) and the presentation of the second word (word 2). ERPs recorded after the presentation of word 1 were segmented to examine FN400 and P600 effects, and ERPs recorded after the presentation of word 2 were segmented to measure N400 effects.

3.7.2   Sentence-Decision Task

Following the semantic-judgment task, learners completed a sentence decision task while their ERPs were recorded. Learners were presented with single context test sentences of medium semantic constraint. These sentences were different from those that were presented during the learning phase, but were normed in a similar fashion. The mean semantic constraint score for these test sentences was 0.41. Each sentence's final word was a word from the learning phase or an untrained rare word. The sentence trials were randomly split into two halves; the final word was congruent with the context of the sentence for one half ("YES" trials; '*She approached her duties as maid of honor with* **alacrity**') and incongruent ("NO" trials; '*Repetitive, meaningless word can lead to a state of* **curmudgeon**') in the other half. The incongruent sentence trials were created by shuffling the final words of the sentences and randomly assigning them to other sentences. After randomly shuffling the words, the experimenter verified that the sentence final word was unrelated to the context of the sentence.

Learners were asked to decide as to whether the final word of each sentence fit the context of the sentence by pressing the appropriate keys. The order of the sentence presentation was randomized for each learner. Each learner completed a set of a 150 sentence trials while ERPs were recorded. This set included 30 test sentences for each of the learning condition and an additional 30 sentences for untrained rare words.

Each sentence trial began with a fixation cross that appeared in the middle of the computer screen for 500 milliseconds. Following fixation, a blank screen was presented for a variable duration of 50 to 250 milliseconds. Each word of the sentence was presented to the learning, word by word. Each word was presented for 700 ms followed by a blank screen of 300 ms in duration. Thus, each word was presented for a total of 700 with an interstimulus interval

of 300 ms. The final word of each sentence (i.e., the target word) was presented for 1000 ms; learners were instructed that they could not make a response until the final word changed to green font; this was done to ensure that motor movements did not interfere with ERPs recorded on the target word. Following the learner's response, a feedback screen that was displayed for 1500 ms indicated the accuracy of their response. If the response was correct, the word 'correct' was displayed on the screen in green, and if the response was incorrect, the word 'incorrect' was displayed in red.

This task was designed to measure how a newly learned word is processed in a new sentence context. ERPs were stimulus locked to the presentation of the final word of each sentence, and the data were segmented to measure N400 effects of meaning integration.

3.8   DEFINITION GENERATION TASK

Following the tasks during which ERPs were recorded, learners completed a definition generation task. Learners were presented with the learned word for the final time, and they were asked to provide short, one to two word definitions for the words. Each word was presented on a computer screen for an unlimited amount of time.   The order of word presentation was randomized. The learner progressed through the list by pressing the appropriate key to move on to the next word. The quality of the definitions was determined using the same scoring system used in the cloze task procedure. This task was designed in to measure learner's word-level semantic knowledge of the words they encountered in the learning phase.

3.9   ERP RECORDINGS

Before beginning the semantic-judgment task, participants were fitted with an electrode cap. The scalp potentials were recorded from 128 sites using a Geodesic Sensor Net (Electrical Geodesics, Eugene, OR) with Ag/AgCl electrodes. All impedances were kept under 40KΩ. A vertex reference was used in the recording, and the data were recomputed offline against the average reference. Six eye channels allowed rejection of trials with eye movements and eye blink artifacts. The EEG signals were recorded with a sampling rate of 1000Hz. The hardware filter was between 0.1 and 200Hz. A 30Hz lowpass filter was applied to all data. ERPs were stimulus-locked to three separate events across the two ERP tasks; the first word and the second word (i.e., the meaning probe) in the semantic judgment task, and the final word in each sentence for the sentence judgment task. For each event, ERPs were averaged over a 1100 millisecond time segment that included a 100 millisecond baseline and a 1000 millisecond epoch that was defined by the presentation of the first word (i.e., learned word), the second word (i.e., the meaning probe), or the final word in the sentence decision task. Bad channels were removed from the recordings and replaced by spherical spline interpolation using data from the remaining channels. This method is effective in approximating the average surface potential on the scalp (e.g., Ferree, 2006; Scherg, Ille, Bonfleth, & Berg, 2002). Any trials containing eye-movements, eye blinks, or channel artifacts were removed and not used in the final analyses. If more than 5 trial segments were rejected due to eye-movement artifacts, the participant's data were excluded from the analyses; the specific number of participants excluded is reported in the experimental methods sections. On average, for each participant, we retained 24 trials per condition after artifact detection. Following trial rejection, ERPs were transformed using average reference and then corrected using a 100ms baseline.

4.0   EXPERIMENT 1: CONTEXT TYPE AND VARIABILITY

4.1   OVERVIEW

According to the word experience model (Reichle & Perfetti, 2003), each word experience is encoded in a memory trace. Memory traces can vary in strength, quality, and quantity, thus affecting the quality of the word representation, and the knowledge that can be retrieved about the word. For the present experiments, the word experience model makes two predictions about the effects of context type and variability on meaning acquisition, and subsequent encounters with the word.

For example, McKeown (1993) reported that definitions are ineffective for meaning acquisition; meaning units that are not grounded in sentence contexts are often difficult for learners to recall and to use properly in context. According to our model, definitions may be encoded in weaker memory traces than context sentences. Therefore, we would predict that superior learning would be observed with context sentences than definitions.

However, definitions may have an advantage over sentence contexts in certain instances. Specifically, the empirical question of whether memory strength depends on the quantity (the sum of all traces) or the cumulative strength of repeated traces has not yet been addressed. For example, varied word experiences of definitions or sentences can lead to a more enriched representation, and more traces, none of which are necessarily stronger than others. Yet repeated

information offers a limited number of memory traces, but with each exposure, these memory traces are strengthened. Therefore, manipulating the variability of the word information using sentences and definitions may address this empirical question.

Thus, the objective of Experiment 1 is to examine the effects of context type (definitions or sentences) and variability (varied or repeated content) on meaning acquisition and word processing. The following two hypotheses are addressed in this experiment:

(1) The context type in which a word has been encountered will result in episodic traces that differ in strength, thereby, affecting familiarity and meaning acquisition. Specifically, the effects of familiarity will be observed by differences in FN400 amplitudes, where words encoded with stronger memory traces would show a reduction of the FN400 from 300 to 500 ms. The effects of meaning acquisition will be observed by differences of N400 amplitudes; words for which learners acquired the meaning will show a reduction of the N400 from 300 to 500 ms.

(2) Contextual variability will affect the strength and quantity of memory traces encoded at learning, thereby, differentially affecting the word recognition processes and meaning acquisition. Specifically, the effects of recognition will be observed in differences in P600 amplitudes; words that are recalled from learning will show greater positivity from 500 to 700 ms. The effects of meaning acquisition will be observed by differences in N400 amplitudes.

4.2   METHODS

4.2.1   Participants

32 right-handed individuals were recruited for the study from the large lexical and comprehension battery database. These learners represented a broad range of ability on comprehension, vocabulary, and lexical skill. All participants were compensated $10/hour for the completion of the study, which lasted approximately 4 to 4.5 hours. Ten learners were eliminated from the final analyses due to unusable EEG data.

4.2.2   Procedure

All learners completed the three phases of the experiment in the following order: working memory assessment, word learning, and word testing.

4.2.3   Design: Word learning

In Experiment 1, the type of context (definition or sentence context) and the variability (varied or repeated) of word information were manipulated to test the effects of word experience on meaning acquisition and processing. This 2 x 2 design yielded four different learning conditions that are described below.   The learning trial presentation was quasi-random; trials were intermixed from all four learning conditions but in a predetermined order to maintain a range of 5 to 10 trials between the first learning trial and subsequent learning trials for all words.

4.2.4 Learning conditions

4.2.4.1 Repeated Definition (repeated D condition)

In this learning condition, learners were presented with a dictionary definition for each learning trial. The same definition was repeated across all four learning trials. For all trials, the learner was presented with the target word on the top of the computer screen, and the definition was displayed below the word.

4.2.4.2 Repeated Context (repeated C Condition)

In this learning condition, learners were presented with a single-repeated sentence context of medium semantic constraint. The same sentence was repeated across all four learning trials. For all trials of this condition, the target word appeared on the top of the computer screen, with the sentence displayed below. A blank replaced where the target word would appear in the sentence to control for frequency of target word presentation.

4.2.4.3 Varied Definition (Varied D Condition)

In this learning condition, learners were presented with four different dictionary definitions, one for each learning trial.

4.2.4.4 Varied Context (Varied C Condition)

In this learning condition, learners were presented with four different single-sentence contexts of medium semantic constraint for each learning trial.

4.3   RESULTS: BEHAVIORAL MEASURES

4.3.1   Comprehension, Vocabulary, and Lexical Skill Assessments

Table 1 summarizes the assessment scores for the 22 participants whose behavioral and EEG were analyzed.

Table 1. Experiment 1: Individual differences measures

Measure	Mean	SD
ND-Comp	18.10	6.27
ND-Vocab	46.87	20.73
Real Word d′	2.35	0.84
Spelling d′	2.11	0.66
PhaT	0.82	0.22
Author d′	2.56	1.53
Raven's	8.79	3.50

4.3.2   Working Memory Assessment

4.3.2.1 OSPAN

Learners averaged 52.78 (SD = 4.81) correctly recalled words out of 60 items on the memory task, with an average set span of 4.00 (SD= 1.36). For the operations task, learners averaged 26.84 (SD = 10.27) of the 60 operations correctly, with an accuracy of 43% correct. From the 32 learners who completed the task, only one had an accuracy of 75%. Given the low accuracy

scores on the operations task and the high scores on the word recall task, there is a reasonable certainty that the learners prioritized the word recall task over the operations task. Therefore, learners' performance on the OSPAN task did not represent a true measure of working memory; these scores were not used in any analyses.

4.3.2.2 RSPAN

Learners averaged 48.67 (*SD* = 13.88) correctly recalled words out of 60 items on the word memory task, with an average set span of 4.0 (*SD* = 1.34). For the sentence comprehensibility task, learners averaged 4.67 (*SD* = 2.76) of the 60 sentences correctly, with an accuracy of 7.93% correct. Given the low accuracy scores on the sentence comprehensibility task and the high scores on the word recall task, there is a reasonable certainty that the learners prioritized the word recall task over the sentence task. Therefore, learners' performance on the RSPAN task did not represent a true measure of verbal working memory; these scores were not used in any analyses.

4.3.3   Initial Familiarity Check

The initial familiarity check at the beginning of the learning phase indicated that over half of the learners were familiar with the word 'fruition' (i.e., 53%), and nearly half were familiar with the word 'platitude' (e.g., 46%). Therefore, these words were eliminated from all of the analyses. For the remaining target words, the percentage of learners that indicated familiarity with any of the target words ranged from 0.06 to 16.7%.

4.3.4 Learning

To examine learning condition and trial effects, a learning condition (repeated C, repeated D, varied C, varied D) x learning trial (first, second, third, fourth) ANOVA was completed on the time in milliseconds that each learner spent on any given learning trial. This analysis was also completed to verify that the learners did not bypass repeated learning trials after their first exposure. Results indicated a main effect of learning condition, $F(3, 29) = 68.11$, $p < .01$, a main effect of learning trial, $F(3, 29) = 24.12$, $p < .01$, and learning condition x learning trial interaction, $F(9, 23) = 10.32$, $p < .01$. Learners spent more time studying context trials ($M = 6092.07$ ms for repeated C, and $M = 8104.24$ ms for varied C) than definition trials ($M = 4525.72$ ms for repeated D, and $M = 4985.44$ ms for varied D). Definitions were shorter in word count than sentence contexts (6.15 and 17.42, respectively) consequently reducing the reading times for definition trials. As indicated by the learning trial main effect, learners spent more time on the first learning trial ($M = 8412.21$ ms) than the second ($M = 6887.32$ms), third ($M = 4932.16$ ms), or fourth ($M = 4476. 87$ ms). As indicated in Figure 2, regardless of learning condition, most time was spent on the first learning trial. The times spent on subsequent learning trials (second, third, and fourth) were not statistically different from each other.
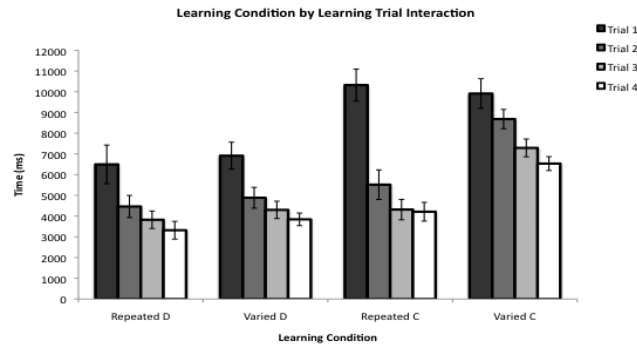
Figure 2. Experiment 1: Learning trial effects

4.3.5 Semantic Judgment Task

4.3.5.1 Reaction Time: Correct Trials Only

The decision times for the semantic-relatedness judgment task for correct trials only are shown in

Figure 3. Average decision times varied between 670 and 810 ms depending on the word type
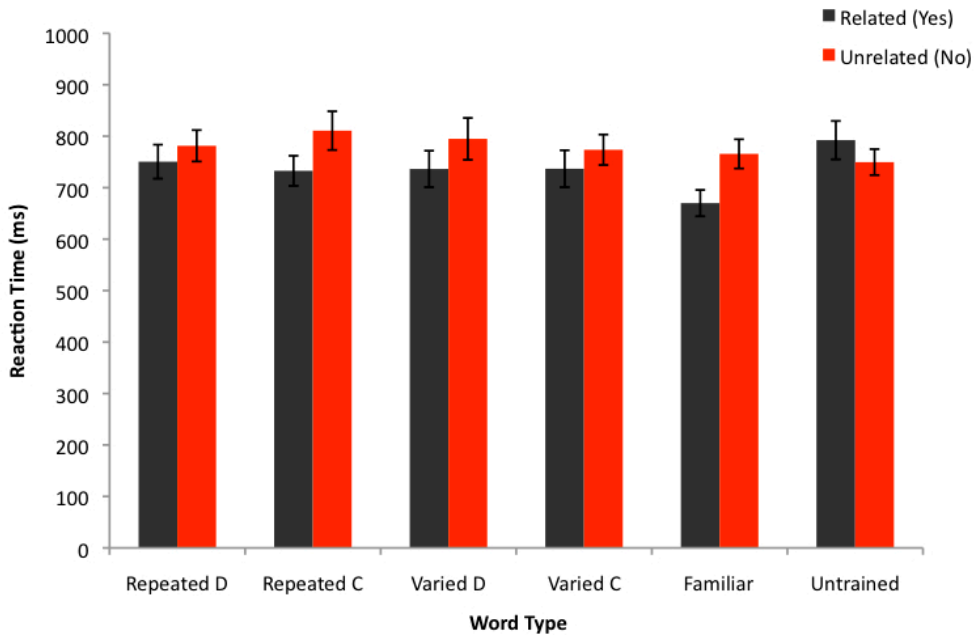
Figure 3. Experiment 1: Word type by relatedness interaction for RT

and trial relatedness. An ANOVA of word type (repeated C, repeated D, varied C, varied D, familiar, untrained) x relatedness (related, unrelated) of the decision times indicated that related ("yes") decisions were made more quickly than unrelated ("no") decisions (736.48 ms versus 779.00 ms), $F (1, 21) = 11.55$, $p < .01$. A significant word type by relatedness interaction, $F (5, 17) = 8.24$, $p < .01$, showed that learners were faster on related than unrelated trials for the repeated C learning condition, ($t (21) = 2.66$, $p < .01$) and for familiar words ($t (21) = 4.27$, $p < .01$). The main effect of word type was not significant, $F (5,17) = 1.75$, $p > .05$.

4.3.5.2 Accuracy

Accuracy performance for the semantic-relatedness judgment task is summarized in Figure 4. An analysis of variance of word type (repeated C, repeated D, varied C, varied D, familiar, untrained) x relatedness (related, unrelated) showed a significant main effect of word type, $F (5, 17) = 59.45$, $p < .01$. Bonferroni adjusted post-hoc comparisons of the six word types indicated that learners responded more accurately to familiar words ($M = .87$) than untrained words ($M = .56$), repeated D words ($M = .62$), repeated C words ($M = .62$), varied D words ($M = .62$), and varied C words ($M = .65$), $p < .001$. Comparisons of the accuracies for the learning conditions (repeated D, repeated C, varied D, and varied C) were not statistically significant, $p > .05$. No significant main effect was observed for relatedness, $F (1, 21) = .716$, $p = .407$. A significant interaction of word type by relatedness was found, $F (5, 17) = 9.46$, $p < .01$, showed significant differences for related and unrelated trials for familiar ($t (21) = -2.83$, $p < .01$) and untrained ($t (21) = 3.11$, $p < .01$) words, and for the varied C ($t (21) = -2.51$, $p < .01$) learning conditions. As illustrated in Figure 4, all word types, except for the untrained words, accuracy was better for related than unrelated trials. For the untrained words, the opposite effect was observed; learners were more accurate for unrelated trials than related trials. This finding perhaps suggests a "no"

bias whereby learners tend to respond "no" for words that are unfamiliar and were not encountered in the learning phase. A similar "no" bias for unfamiliar words has been observed in other word learning studies (e.g., Balass et al., 2010; Perfetti et al., 2005).
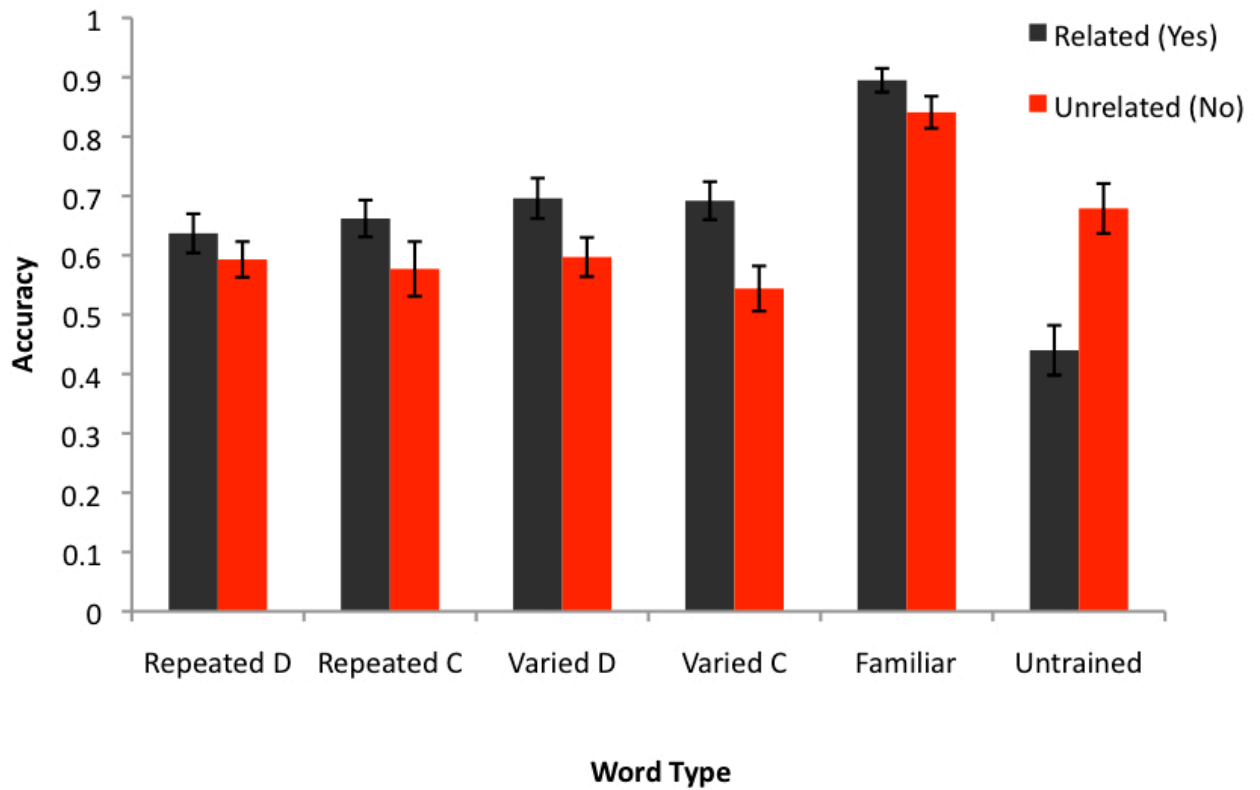
Figure 4. Experiment 1: Word type by relatedness interaction for accuracy

4.3.6 Sentence Decision Task

The accuracy performance for this task was of more interest than decision times because the paradigm for this task employed a delayed response. Accuracy performance was analyzed in a word type (repeated C, repeated D, varied C, varied D, untrained) x congruency (congruent, incongruent) ANOVA. A main effect of word type, $F_{(4,15)} = 4.61$, $p < .05$, indicated differences in accuracy between the learning conditions (repeated C, repeated D, varied C, varied

D) and the untrained words. Bonferroni adjusted post-hoc comparisons of the five word types indicated that learners were less accurate for untrained words ($M = .57$) than for repeated D words ($M = .64$), repeated C words ($M = .64$), varied D words ($M = .66$), and varied C words ($M = .65$), $p < .001$. Comparisons of the accuracies for the learning conditions (repeated C, repeated D, varied C, and varied D) were not statistically significant. The main effect of congruency was not significant, $F (1, 18) = 1.65$, $p = .216$. Figure 5 illustrates the significant interaction of word type and congruency, $F (4, 5) = 10.54$, $p < .01$. Learners were more accurate on congruent trials for the
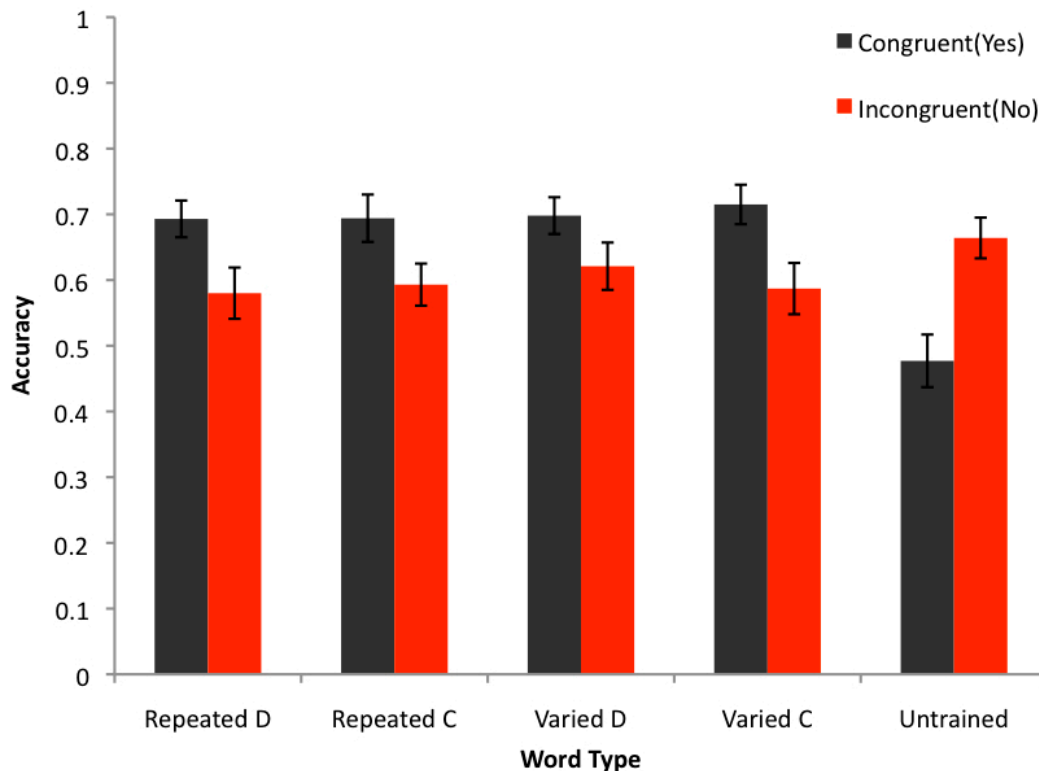
Figure 5. Experiment 1: Word type by congruency effect for accuracy

varied C condition ($t (18) = -3.22$, $p < .01$ than all other learning conditions. The opposite effect was observed for the untrained words, learners were more accurate for incongruent than

incongruent trials, t (18) = 2.99, $p < .01$. As observed in the semantic-relatedness task, learners have a "no" bias for words that are unfamiliar.

4.3.7   Definition Generation Task Semantic Judgment Task

Learners' definition generation scores were averaged to generate a final accuracy score for each condition. A type (definition, context) x variability (repeated, varied) ANOVA indicated a main effect of type, F (1,31) = 5.32, $p < .05$ and a main effect of variability F (1, 31) = 7.21, $p < .05$. Learners were more accurate in generating definitions for words learned with definitions (M = .434) than for words learned with context sentences (M = .391). Further, words that were presented in varied learning trials (M = .438) generated more accurate responses than words presented in repeated learning trials (M = .387).

4.3.8   Individual Differences Measures

Individual assessment scores from our lexical and comprehension battery were correlated with each behavioral measure from the three tasks. Additionally, d-prime scores were computed for the semantic and sentence judgments tasks, and were added to the correlation analysis as an individual difference measure.

4.3.8.1 Semantic Judgment Task: Reaction Time and Accuracy

As illustrated in Table 2, significant negative correlations were found with comprehension and vocabulary scores for familiar words; faster reaction times were correlated with higher scores on both tests. The PHaT was positively correlated with slower performance for untrained trials (r =

.451, $p < .05$), whereas the real word test was positively correlated with performance on repeated C ($r = .511$, $p < .01$) and varied C trials ($r = .452$, $p < .05$). These correlations indicate that phonological skills were related to faster (not necessarily more accurate) decisions when less information is known about a word's meaning (i.e., untrained) or when a word is learned with single sentence contexts. The PHaT was positively correlated with slower performance for untrained trials ($r = .451$, $p < .05$), whereas the real word test was positively correlated with performance on repeated C ($r = .511$, $p < .01$) and varied C trials ($r = .452$, $p < .05$). These correlations indicate that phonological skills were related to faster (not necessarily more accurate) decisions when less information is known about a word's meaning (i.e., untrained) or when a word is learned with single sentence contexts.

Table 2. Experiment 1: Reaction time and individual differences correlations

Measure	Repeated D	Repeated C	Varied D	Varied C	Familiar	Untrained
ND-Comp	-.200	-.298	-.376	-.259	**-.523***	-.359
ND-Vocab	-.114	-.282	-.409	-.221	**-.504***	-.209
Real Word	.402	**.511****	.303	**.452***	.267	**.499***
Spelling	.288	.080	.016	.237	.167	.290
PhaT	.293	.361	.361	.414	.431	**.451***
Author	-.038	-.162	-.276	.071	-.181	-.004
Raven's	-.106	-.035	-.035	.000	-.028	-.131
d-prime	.407	.145	.104	.323	.049	.297

N = 22, ** Correlation is significant at the .01 level
* Correlation is significant at the .05 level

As illustrated in Table 3, vocabulary and comprehension scores were correlated with accuracy performance. Comprehension scores were positively correlated with better accuracy for familiar words, whereas vocabulary scores were correlated with accuracy on the repeated C and varied D learning conditions, and familiar words. Text exposure, as measured by the author recognition test was correlated with more accurate performance for repeated C, varied D, and untrained trials.

Table 3. Experiment 1: Accuracy and individual differences correlations

Measure	Repeated D	Repeated C	Varied D	Varied C	Familiar	Untrained
ND-Comp	.083	.358	.156	-.108	**.516***	.279
ND-Vocab	.271	**.446***	**.542****	.272	**.545****	.386
Real Word	**.457***	.287	.225	.441	.428	**.500***
Spelling	-.014	.380	**.465***	.263	.017	.284
PhaT	.006	.311	.188	.381	.077	.078
Author	.297	**.528****	**.438***	.338	.346	**.599****
Raven's	.117	-.073	-.048	.364	.123	.079

N = 22, ** Correlation is significant at the .01 level
* Correlation is significant at the .05 level

4.3.8.2 Sentence Judgment Task: Accuracy

Accuracy for this task was positively correlated with vocabulary scores for varied D trials ($r = .572$, $p < .05$) and untrained trials ($r = .471$, $p < .05$), indicating better accuracy being associated

with higher vocabulary scores. Scores for the author recognition task was positively correlated with accuracy on the repeated C condition ($r = .526$, $p < .05$).

4.3.8.3 Definition Generation Task

Vocabulary performance was positively correlated with definition accuracy across all word types; repeated D $r = .411$, p < .05, repeated C $r = .591$, p < .01, varied D $r = .439$, p < .01, and varied C $r = .509$, p < .01. Performance on the author recognition test was positively correlated with definition accuracy for repeated C $r = .364$, p < .05 and varied C $r = .416$, p < .05 trials.

4.4 ERP RESULTS

For the present experiments, three ERP components were of interest, the FN400 and the P600, which indicate old/new effects of familiarity and recollection, and the N400, which indicates semantic processing. ERP data were analyzed using 200 ms time windows appropriate for each of these components. Data were averaged at nine electrode clusters based on the standard 10-20 electrode placement system. Each electrode cluster was an average of six or seven (for C3 and C4) electrodes that surrounded the standard nine electrode locations of the 10-20 system (i.e., F3, Fz, F4, C3, Cz, C4, P3, Pz, P4). Each electrode cluster site has a letter and a number to identify its location on the scalp. The letters in this notation (e.g., F, C, and P) signify the lobe and the numbers signify the hemisphere (i.e., odd numbers are left hemisphere locations and even numbers are right hemisphere locations; z denotes midline electrodes). Thus, electrodes F3, Fz, and F4 are located on frontal locations on the scalp; electrodes C3, Cz, and C4 are located on

central locations on the scalp; electrodes P3, Pz, and P4 are located further back, on parietal locations on the scalp. Figure 6 illustrates the electrode clusters and their location on the scalp. These 9 electrodes clusters were selected based on previous research indicating that P600 effects are typically observed in central and parietal electrode sites (Curran, 1999; Rugg et al., 2000) and that N400 effects are typically observed in central-parietal electrode sites (Kutas & Hillyard, 1980). Further, FN400 familiarity effects have been observed in frontal electrode locations (Curran, 2007; Curran & Hancock, 2007).
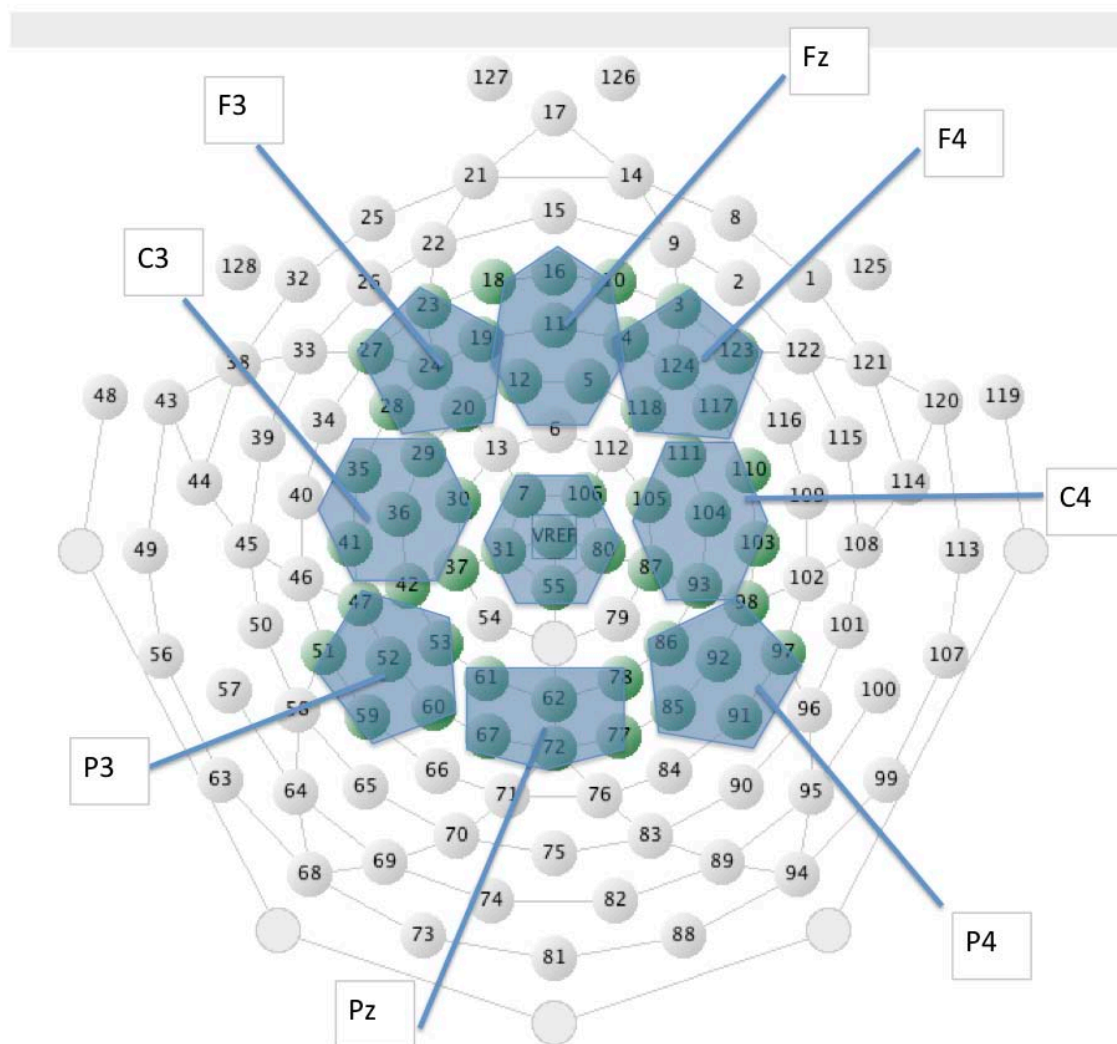
Figure 6. Standard 10 - 20 electrode placement system

4.4.1 Semantic Judgment Task

ERPs recorded during the semantic judgment task were stimulus-locked to the presentation of word 1 and word 2. For word 1, familiarity and recollection processes were of interest; therefore, the data were segmented from 300 to 500 ms to test for FN400 old/new effects of familiarity, and from 500 to 700 ms to test for P600 old/new effects of recollection. For word 2, meaning processing was of interest; therefore, the data were segmented from 300 to 500 ms to test for N400 effects of meaning processing. The time windows used in the analyses were selected to span 100 ms in each direction of the hypothesized time in which we expected to observe the FN400, P600, and N400. Mean amplitude values were computed across all time points in the specified time window.

The results below describe analyses from the omnibus ANOVA. These are followed by tests of our a priori hypotheses where necessary. The Greenhouse-Geisser (GG) correction (Greenhouse & Geisser, 1959) was applied to all factors that violated the assumption of sphericity. Mean amplitudes for all ERP components are reported in microvolts (μV).

4.4.1.1 WORD 1 300 to 500ms

The FN400 is hypothesized to index familiarity of old versus new items, and memory strength that may be modulated by repetition. The word-instance model makes the assumption that different word experiences result in memory traces that vary in strength. Our a priori hypotheses predicted that words that are learned with definitions or sentence contexts will result in memory traces of differing strength, and that these differences would be indexed by the FN400. Further, these differences may also be affected by whether the definition or context is varied or repeated

across learning trials. An omnibus ANOVA of word type (repeated D, repeated C, varied D, varied C, familiar, untrained) x lobe (frontal, central, parietal) x Hemisphere (left, midline, right) indicated a main effect of word type, F (5, 17) = 3.60, p < .05. Bonferroni adjusted multiple comparisons indicated repeated D words (M = .12) to be more positive than untrained words (M =-.53), p < .01. Repeated C (M =-.13), varied D (M = -.28), varied C (M = .027) and familiar words (M =-.027) did not differ significantly from untrained words. Words from the four learning conditions did not differ significantly from each other, thus indicating a FN400 familiarity effect only for repeated D words when compared to the untrained words, which showed the most negative amplitudes from 300 to 500 ms.

Our a priori hypothesis was that the largest differences for the FN400 would be located in frontal electrodes (see Curran, 2007). To test this prediction a word type (repeated D, repeated C, varied D, varied C, familiar, untrained) x frontal hemisphere (F3, Fz, F4) ANOVA was completed to examine the FN400 in frontal lobe locations. A main effect of word type F (5, 17) = 2.99, p < .05 indicated significant differences among the word types. Bonferroni adjusted multiple pairwise comparisons indicated that repeated D (M = .74) and varied C (M = .72) words were more positive than untrained (M = -.158) words, p < .01. Repeated C (M = .46), varied D (M = .12), and familiar (M = .55) words were not different from untrained words. Again, words from the four learning conditions did not differ from each other. The interaction of word type and frontal hemisphere was not significant, F (10,12)= 2.19, p = .10

We computed the magnitude of the FN400 by subtracting the mean amplitude of untrained words from each of the learning conditions and familiar words using the average amplitude of all three frontal hemisphere locations for each condition. Table 4 shows the magnitude of the FN400 for each condition. The FN400 magnitudes for learned conditions and

familiar words did differ significantly, $F_{(4,110)} = 1.02$, $p = .40$. These magnitude results may not be significant due to variability across learners, but they do suggest greater familiarity for that repeated D and varied C trials. Interestingly, for definition conditions, varied content does not facilitate familiarity, possibly suggesting weaker episodic traces for varied definitions.

Table 4. Experiment 1: FN400 magnitude by word type

p = .40	
Word Type	**FN400 Magnitude**
Repeated D	0.90
Repeated C	0.62
Varied D	0.29
Varied C	0.88
Familiar	0.71

However, the data do not support a FN400 old/new effects for repeated D trials and varied C trials, suggesting that for familiarity processes, repeated content is better for definitions and varied content is better for sentence contexts. Figures 7, 8, and 9 show the ERP waveforms for the FN400 at the three frontal hemisphere locations along with bar graphs showing the amplitude of each word type from 300 to 500ms.
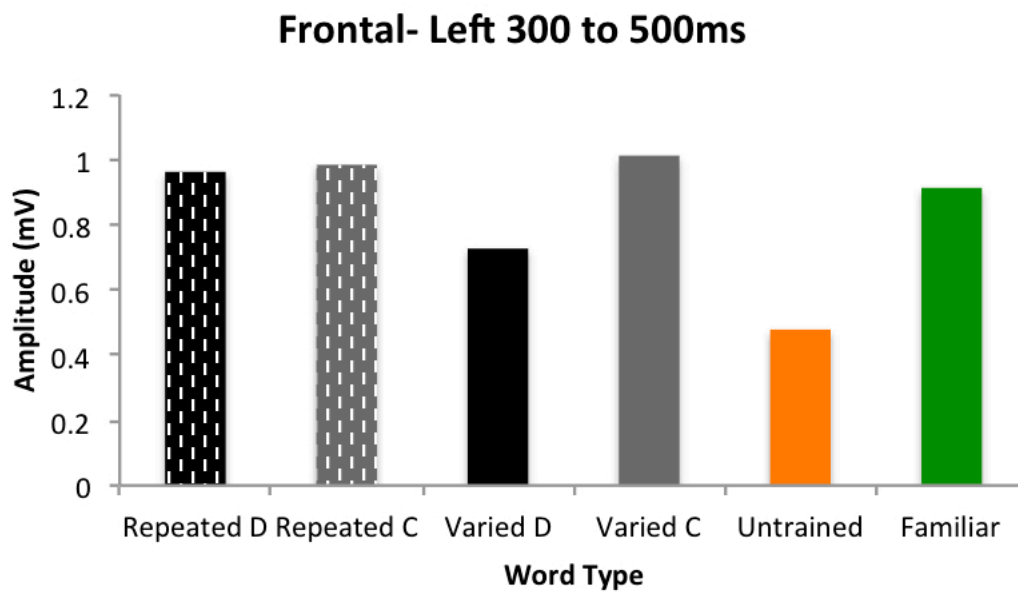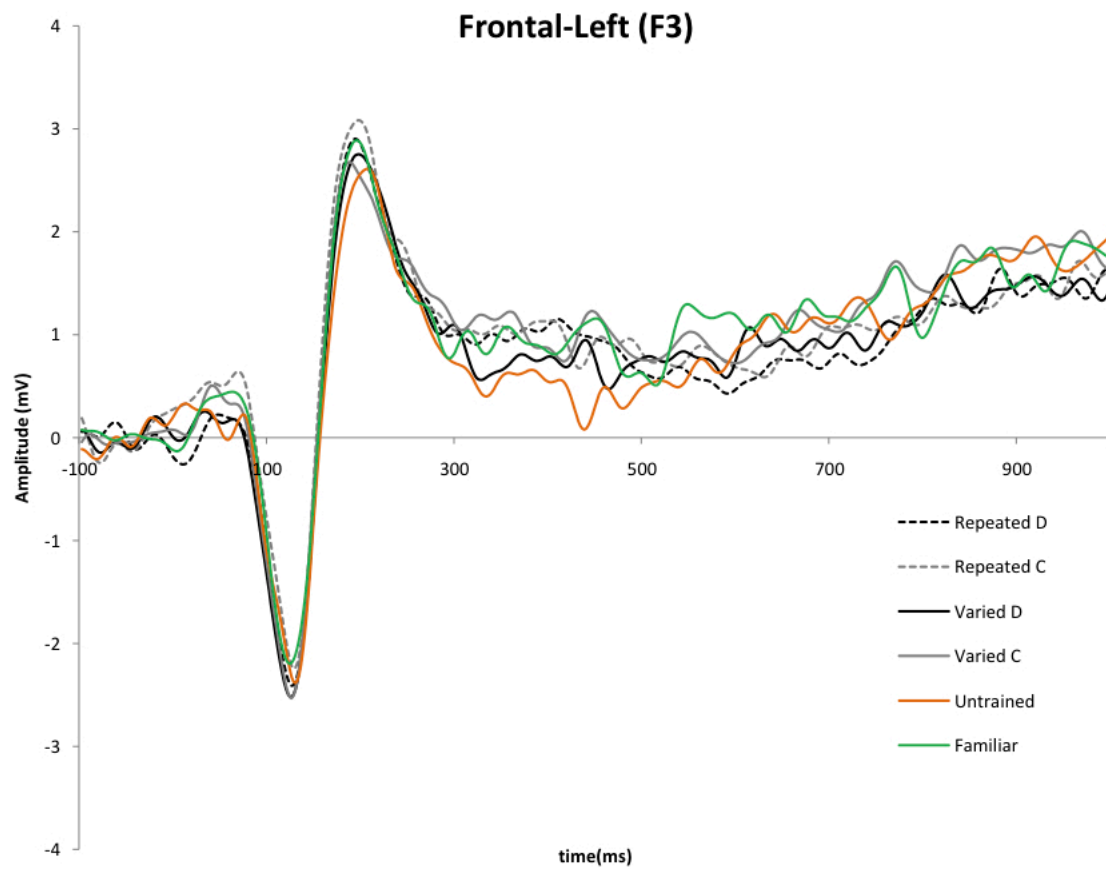
Figure 7. Experiment 1: FN400 effects at frontal-left locations

Frontal-Midline (Fz)

Frontal-Midline 300 to 500ms
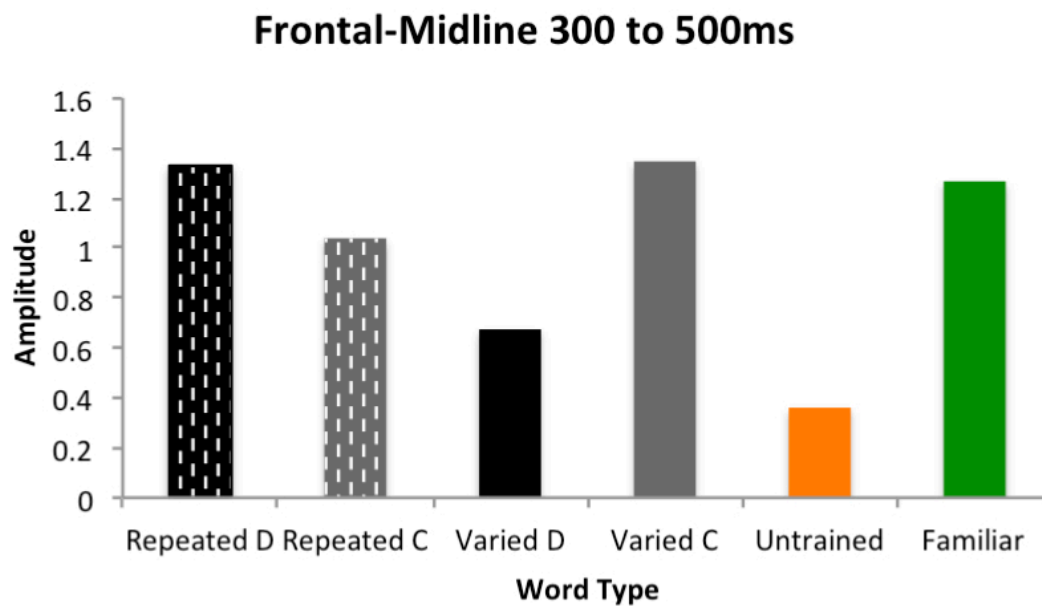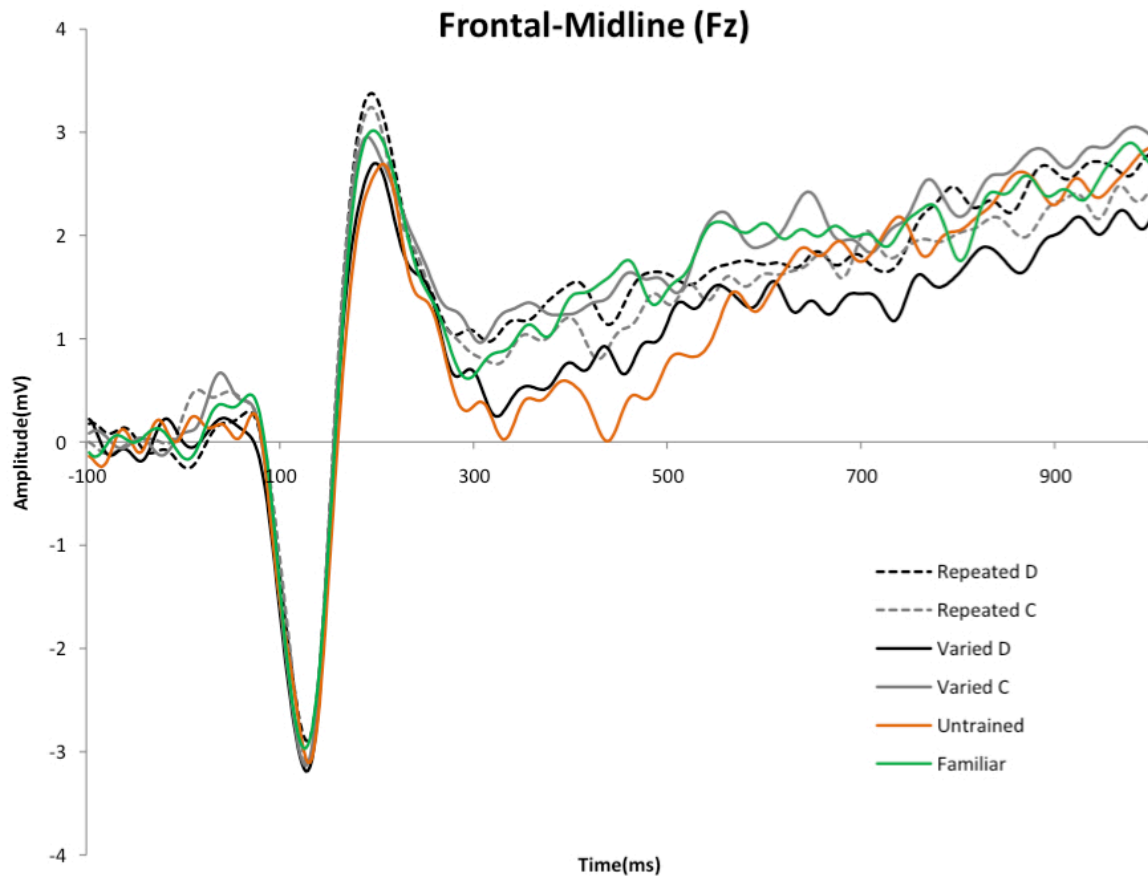
Figure 8. Experiment 1: FN400 effects at frontal-midline locations
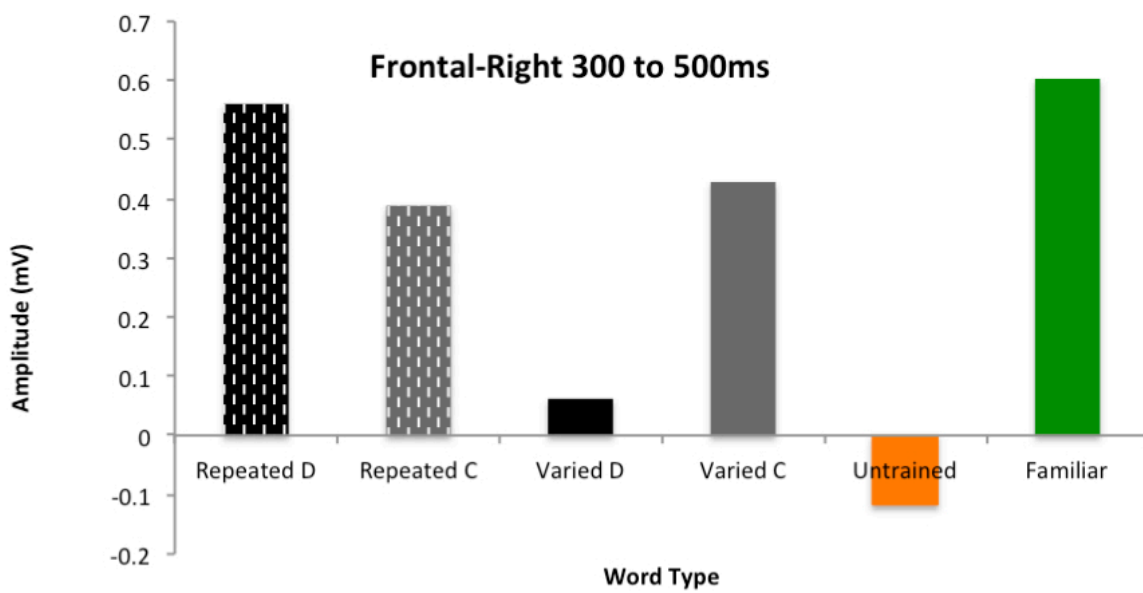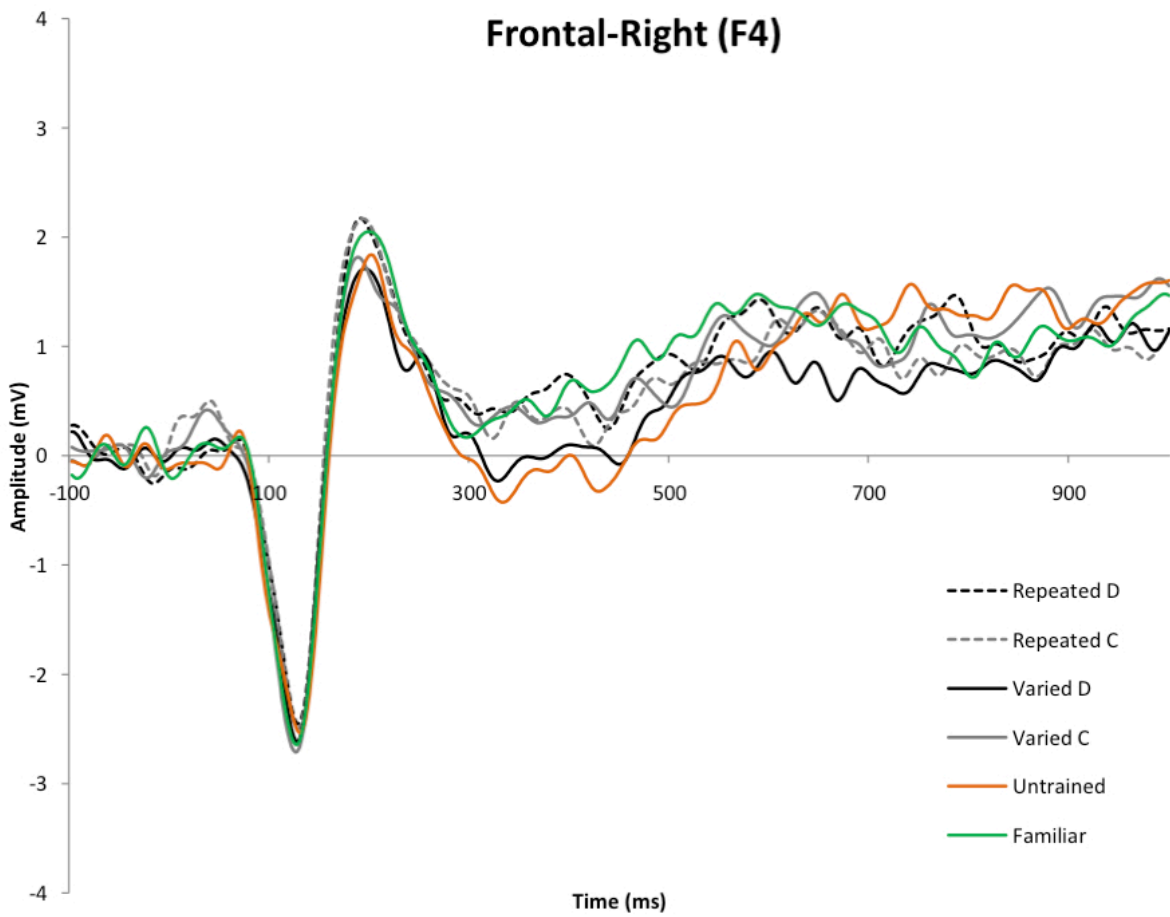
Figure 9. Experiment 1: FN400 effects at frontal-right locations

4.4.1.2 Semantic Judgment Task: WORD 1 500 to 700ms

The P600 is hypothesized to index episodic recollection of old versus new items, and has been observed in word learning studies indicating differences between learned word and unlearned words (Balass et al., 2010; Perfetti et al., 2005). Our a priori hypothesis was that words from learning conditions (repeated C, repeated D, varied C, varied D) would show more positive amplitudes from 500 to 700 ms than words not encountered in learning (untrained and familiar). An omnibus ANOVA of word type (repeated C, repeated D, varied C, varied D, familiar, untrained) x lobe (frontal, central, parietal) x hemisphere (left, midline, right) did not indicate any significant differences for word type, $F (5, 17) = 2.17$, $p = .106$, or interactions with word type and lobe, $F (10,12) = 2.12$, $p = 0.11$, and hemisphere, $F (10, 12) = 1.67$, $p = 0.12$. The three-way interaction of word type x lobe x hemisphere did not reach significance, $F (20, 2) = .31$, $p = 0.94$

We replicated this analysis with parietal locations to test our a priori predictions that the largest P600 old/new effects would be observed in parietal locations (see Wilding & Rugg et al., 1997). A word type (repeated C, repeated D, varied C, varied D, familiar, untrained) x parietal hemisphere (P3, Pz, P4) did not indicate significant main effects or interactions. However, a marginal main effect of word type, $F (5,17) = 2.56$, $p = .067$, indicated a P600 old/new effect trend. Learned trials, repeated D ($M = -.45$), varied D ($M = -.53$), varied C ($M = -.49$), showed greater positive amplitudes than untrained ($M = -.71$) and familiar ($M = -.82$) word trials. Repeated C words' amplitudes ($M = -.84$) were as negative as for the untrained and familiar trials. Table 5 shows the magnitude of the P600 for each word type; these values were computed by subtracting the mean amplitude for untrained trials from each of the learning conditions and

the familiar word trials. These values suggest larger P600 effects for repeated D and varied C conditions,

Table 5. Experiment 1: P600 magnitude by word type

p = .067	
Word Type	**P600 Magnitude**
Repeated D	0.26
Repeated C	-0.13
Varied D	0.18
Varied C	0.22
Familiar	-0.11

whereas for repeated C conditions, very small effects were observed. These data suggest similar effects to those that were observed with the FN400 magnitude; for these word types, recollection processes are more reliable for repeated D and varied C conditions. Figures 10, 11, and 12 show the ERP waveforms for the P600 at the three parietal hemisphere locations along with bar graphs showing the amplitude of each word type from 500 to 700ms.
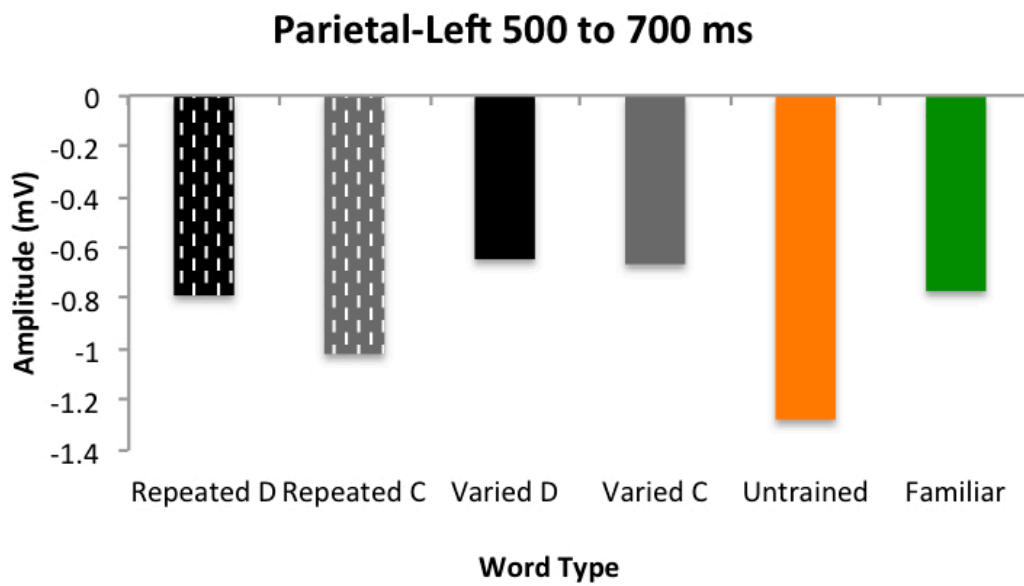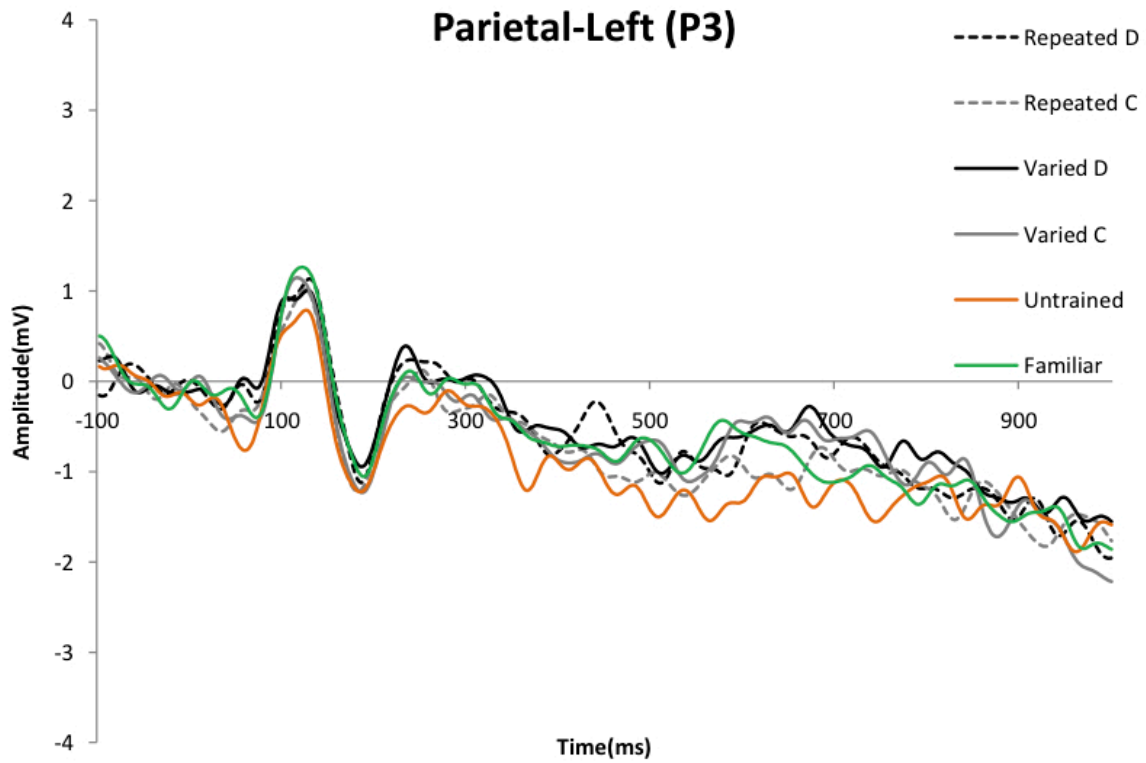
Figure 10. Experiment 1: P600 effects at parietal-left locations
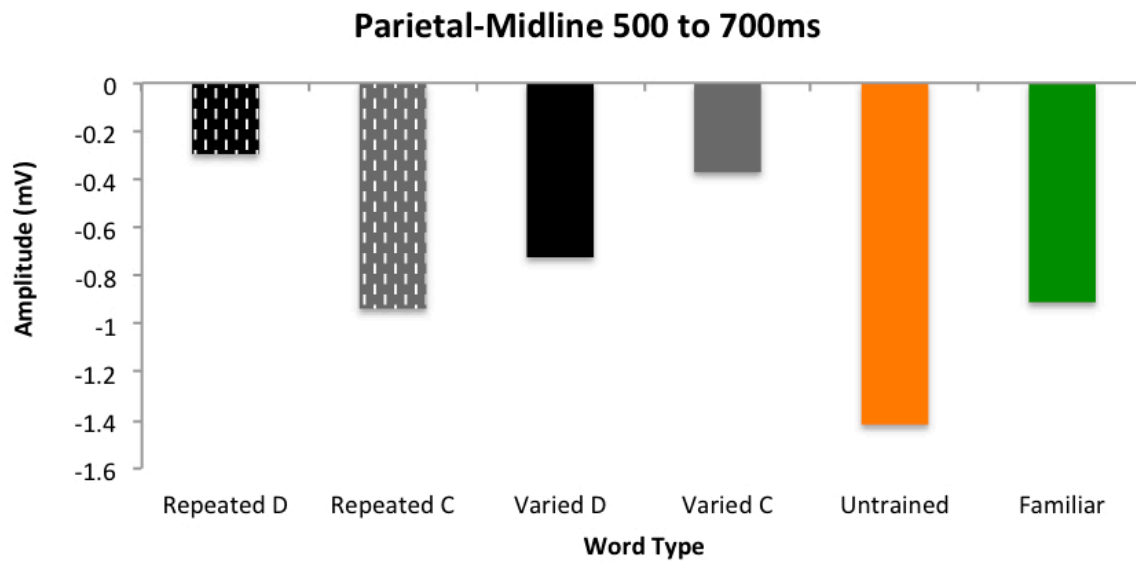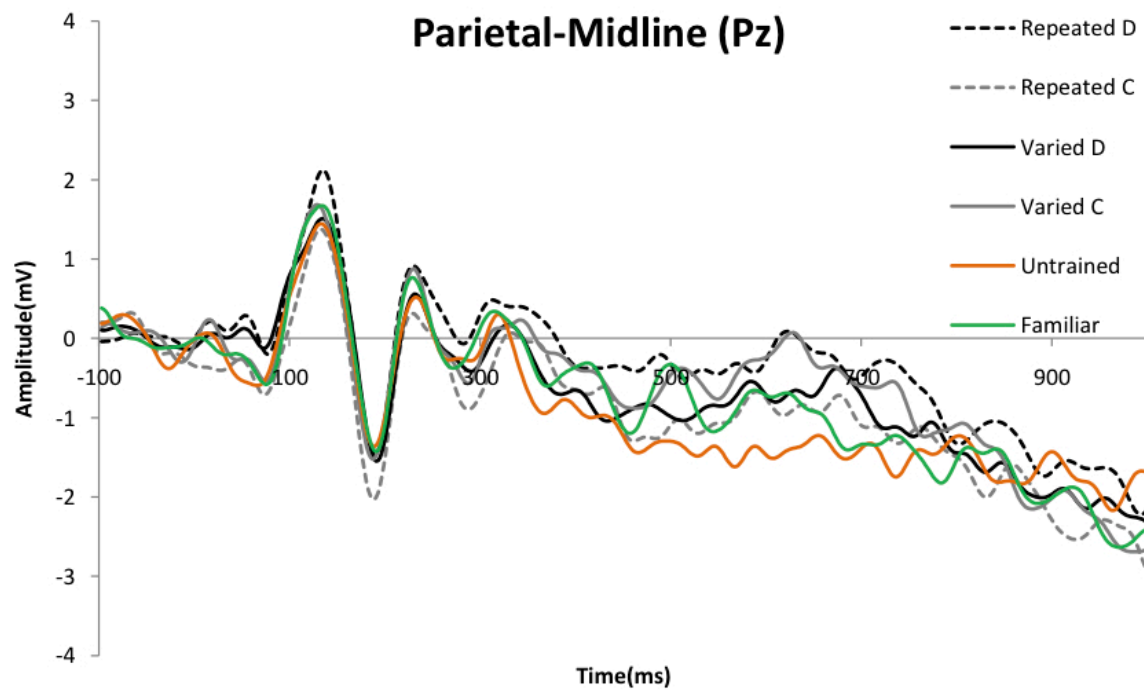
Figure 11. Experiment 1: P600 effects at parietal-midline locations
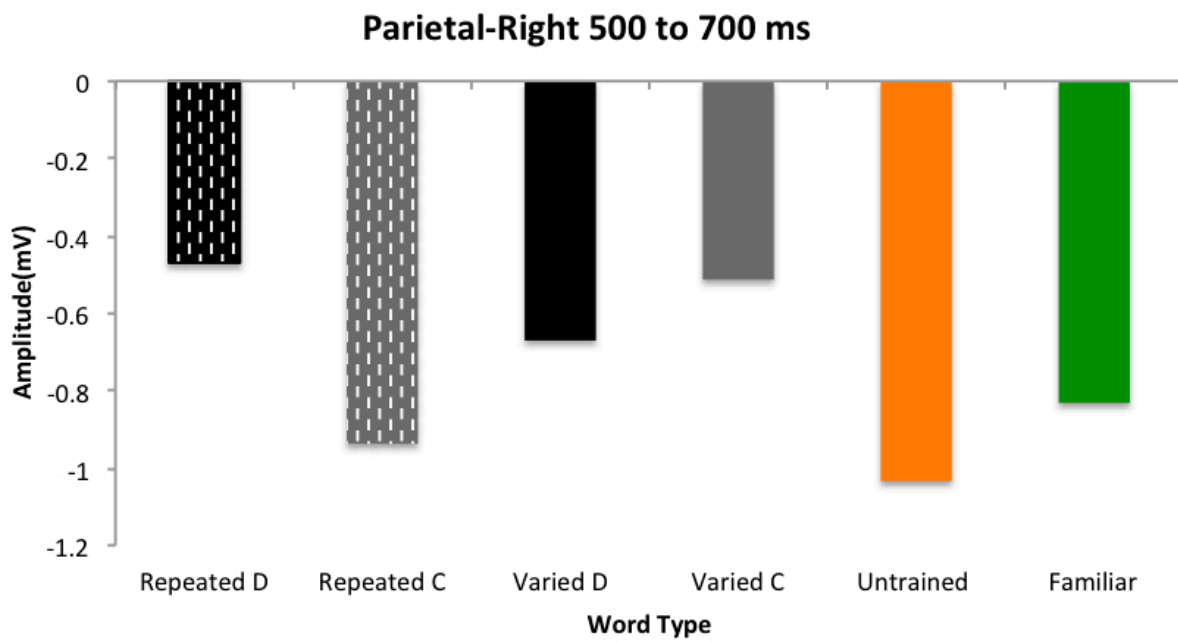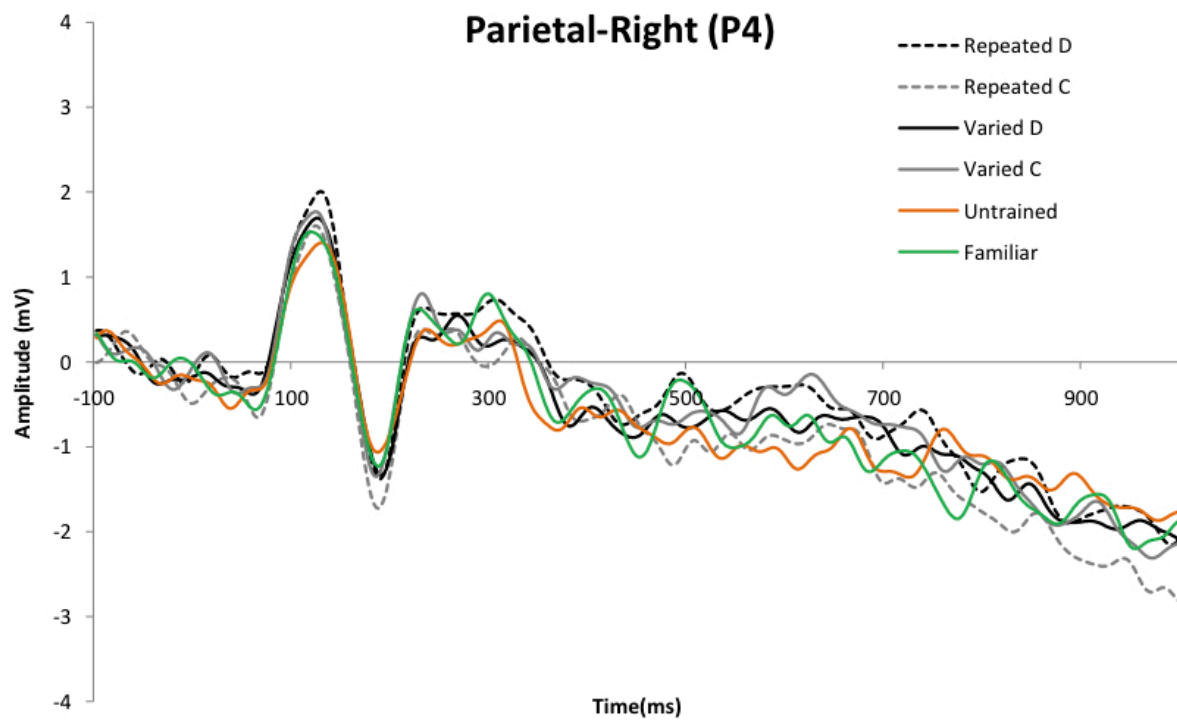
Figure 12. Experiment 1: P600 effects at parietal-left locations

4.4.1.3 Semantic Judgment Task: WORD 2 300 to 500ms

The N400 is a semantic processing component that reflects meaning relatedness between a word

and its previous context.   When a word is incongruent with its context, greater negative

amplitudes are observed at approximately 400 ms at central and parietal electrode sites. A word

that is presented with a related context, which can be another word or sentence, produces a

reduced N400 negative amplitude.   Our hypothesis was such that if learners learned the

meanings of the target words, we should observe a reduction of the N400 effect for related word

pairs (*abjure–recant*) and an N400 effect for unrelated word pairs (*abjure- belittle*); these

differences should be observed in central and parietal electrode locations. We predicted that the

largest N400 reductions would be observed for words learned with varied contexts rather than for

single repeated contexts or definitions because varied contexts allow for the abstraction of word

meaning over multiple episodes.

An omnibus ANOVA of word type (repeated C, repeated D, varied C, varied D,

untrained, familiar) x relatedness (related, unrelated) x lobe (frontal, central, parietal) x

hemisphere (left, midline, right) indicated a main effect of relatedness, $F(1, 21) = 10.01$, $p < .01$.

Overall, the mean amplitude of related word pairs ($M = .074$) was more positive than the mean

amplitude for unrelated word pairs ($M= -.17$), $p < .01$.   This finding indicated an overall

reduction of the N400 for related word pairs, and suggests that learners acquired some meaning

information about the words. No other main effects were observed.

A significant interaction of relatedness x lobe, $F(2, 20) = 7.00$, $p < .01$ indicated

differences between N400 effects across frontal, central, and parietal lobes.   Pair-wise

comparisons showed significant differences for related and unrelated word pairs for central lobe t

$(21) = 4.10$, $p < .01$ (related $= -.30$, unrelated $= -.66$), and parietal lobe t $(21) = 2.60$, $p < .01$

(related = .45, unrelated = .075), respectively. The relatedness effect for frontal lobe was not significant, t (21) = -.045, *p* = .96 (related = 0.07, unrelated=0.77). The N400 magnitudes (related trials-unrelated trials were as follows: frontal = -.007, central = .369, and parietal = .373.

A significant interaction of word type x relatedness x hemisphere, F (10, 12) = 3.57, p < .05 indicated differences in mean amplitudes between related and unrelated trials for left (F3, C3, P3), midline (Fz, Cz, Pz), and right electrode locations (F4, C4, P4) for all trial types. To examine word type and relatedness effect across hemisphere locations, six ANOVAs, one for each word type were completed. Relatedness x hemisphere ANOVAs did not indicate any main effects for relatedness or relatedness by hemisphere interaction for repeated D, repeated C. varied D, and untrained words. A marginal effect of relatedness by hemisphere was observed for varied C words, F (2, 20) = 3.14, p = .065. A significant effect of relatedness, F (1,21) = 15.88, *p* < .01, and a significant interaction of relatedness and hemisphere, F (2, 20)=5.71, p < .05 was found for familiar words. Related familiar word pairs (*M* = 1.06) were more positive than unrelated familiar word pairs (*M* = .034), therefore showing a reduction of the N400.

Table 6 shows the magnitude of the N400 for all word types by hemisphere location. The magnitude of the N400 was computed by subtracting the mean amplitude of unrelated trials from the mean amplitude of related trials. Pair-wise comparisons indicated a marginal effect of

Table 6. Experiment 1: N400 relatedness magnitude by word type and hemisphere location

	N400 Magnitude			
	Left	**Midline**	**Right**	***p*-value**
Repeated D	0.18	0.03	0.08	*p* =.79
Repeated C	0.24	0.35	-0.01	*p* =.24
Varied D	0.27	0.01	0.02	*p* = .64
Varied C	-0.27	0.34	**0.64‡**	*p* = .065
Untrained	-0.08	-0.31	-0.16	*p* = .61
Familiar	**0.51‡**	**1.46****	**1.10****	*p* < .05

** significant at the *p* < .01
‡ marginal effect, *p* > .05

relatedness at right hemisphere location for varied C trials, t (21) = 1.81, *p* = .085, related trials

(*M* = .75) and unrelated trials (*M* = .11). For familiar words significant relatedness effects were

found at midline locations, *t* (21) = 4.28, p < .01, (related trials (*M* = 1.37) and unrelated trials (*M*

= -.092)), and right locations *t* (21) = 3.17, p < .01, (related trials (*M* = 1.44) and unrelated trials

(*M* = .34)). These data suggest a hemispheric lateralization for the varied C relatedness effects at

right locations, whereas the relatedness effect for familiar words is robust across hemisphere

locations.

The findings from these two interactions replicate similar findings by Borovsky, Elman,

and Kutas (2008) who reported large N400 effects for a similar word learning paradigm. In their

study, the largest N400 magnitudes were observed in central and parietal lobes, with a

hemispheric lateralization at midline locations. Figure 13, 14, 15, and 15 illustrate the

waveforms for the N400 relatedness effect ad central and parietal lobes at midline and right

hemispheres.
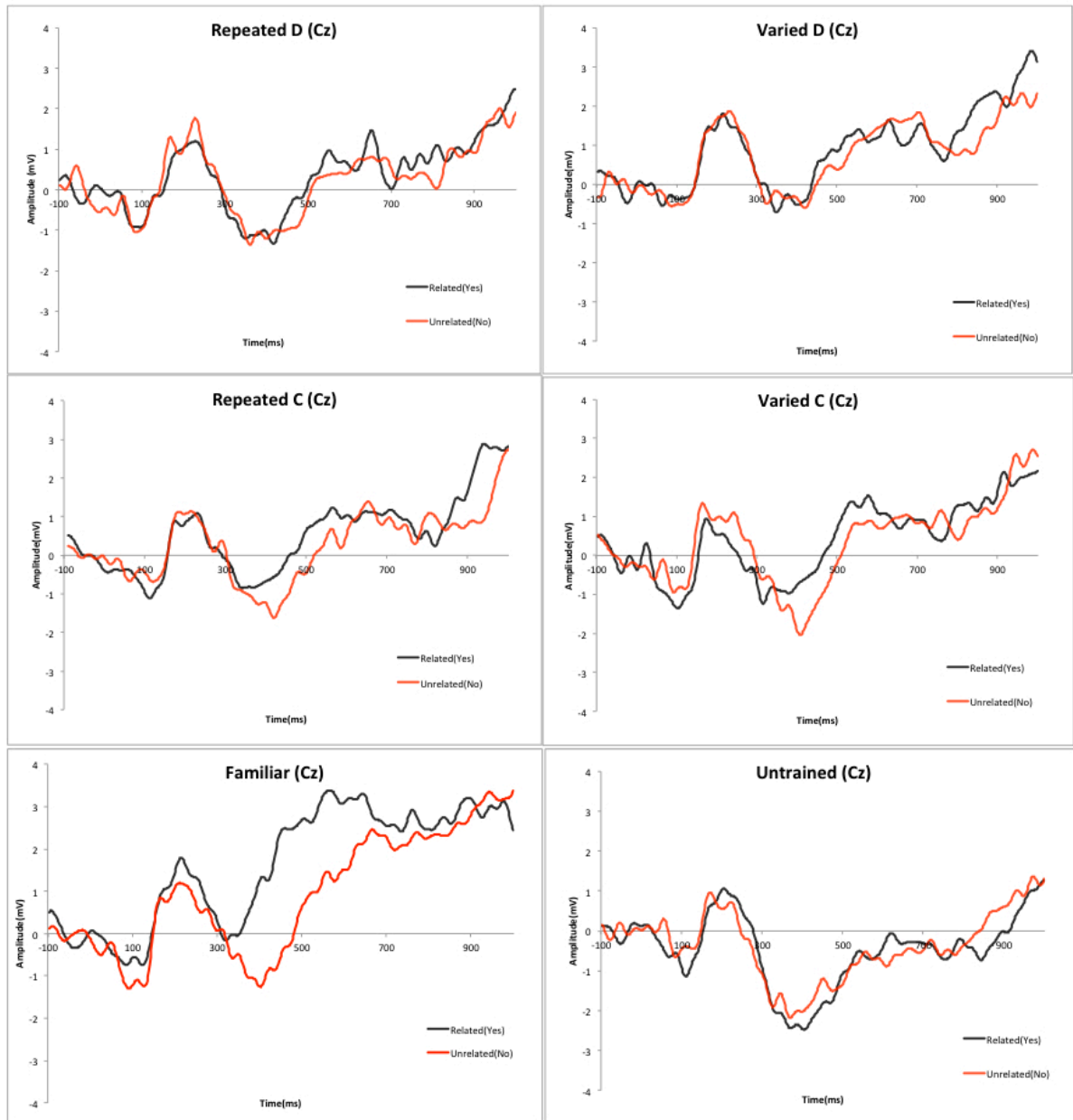
Figure 13. Experiment 1: Semantic judgment N400 relatedness effects at central-midline locations
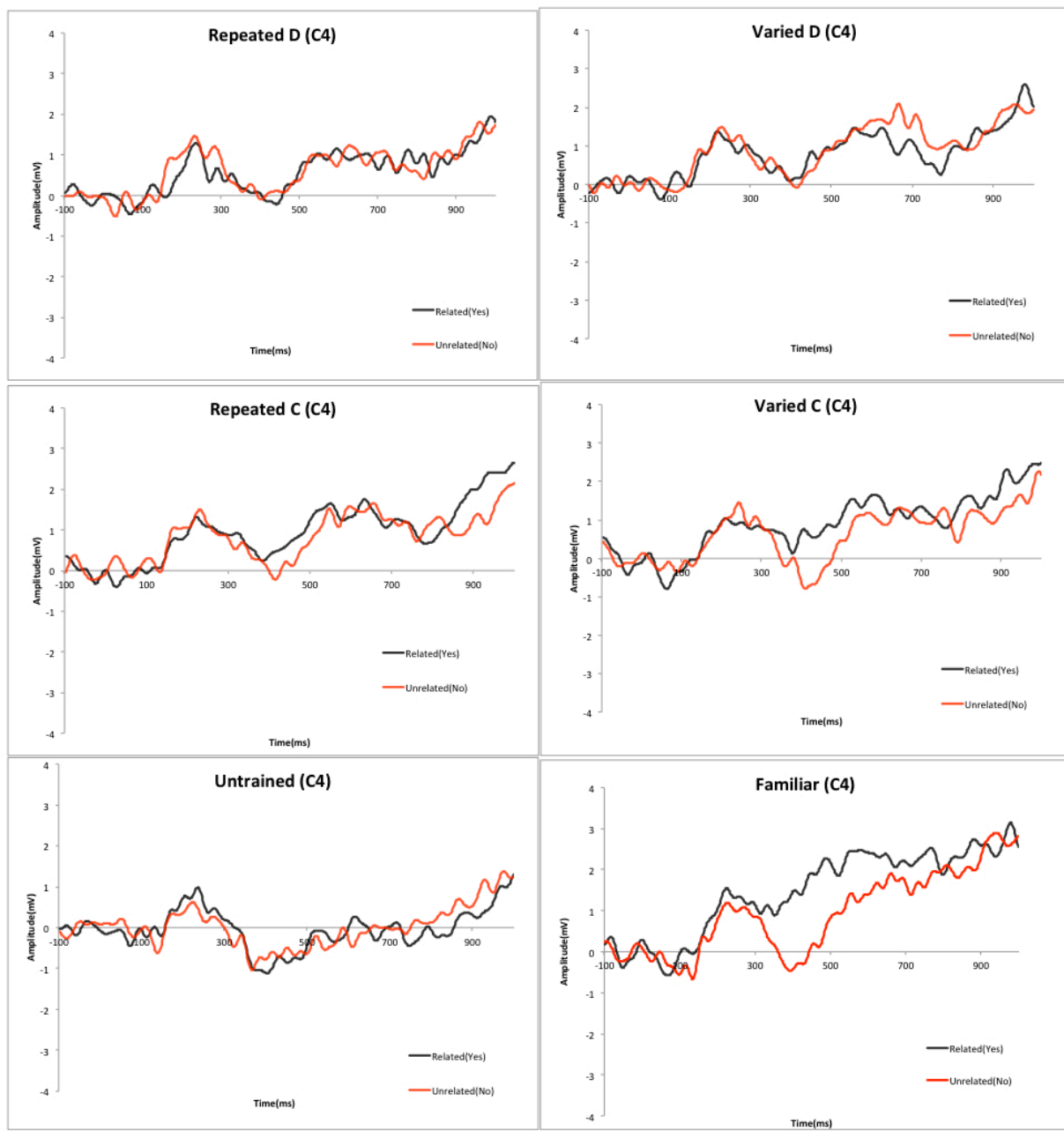
Figure 14. Experiment 1: Semantic judgment N400 relatedness effects at central-right locations

Figure 15. Experiment 1: Semantic judgment N400 relatedness effects at parietal-midline locations
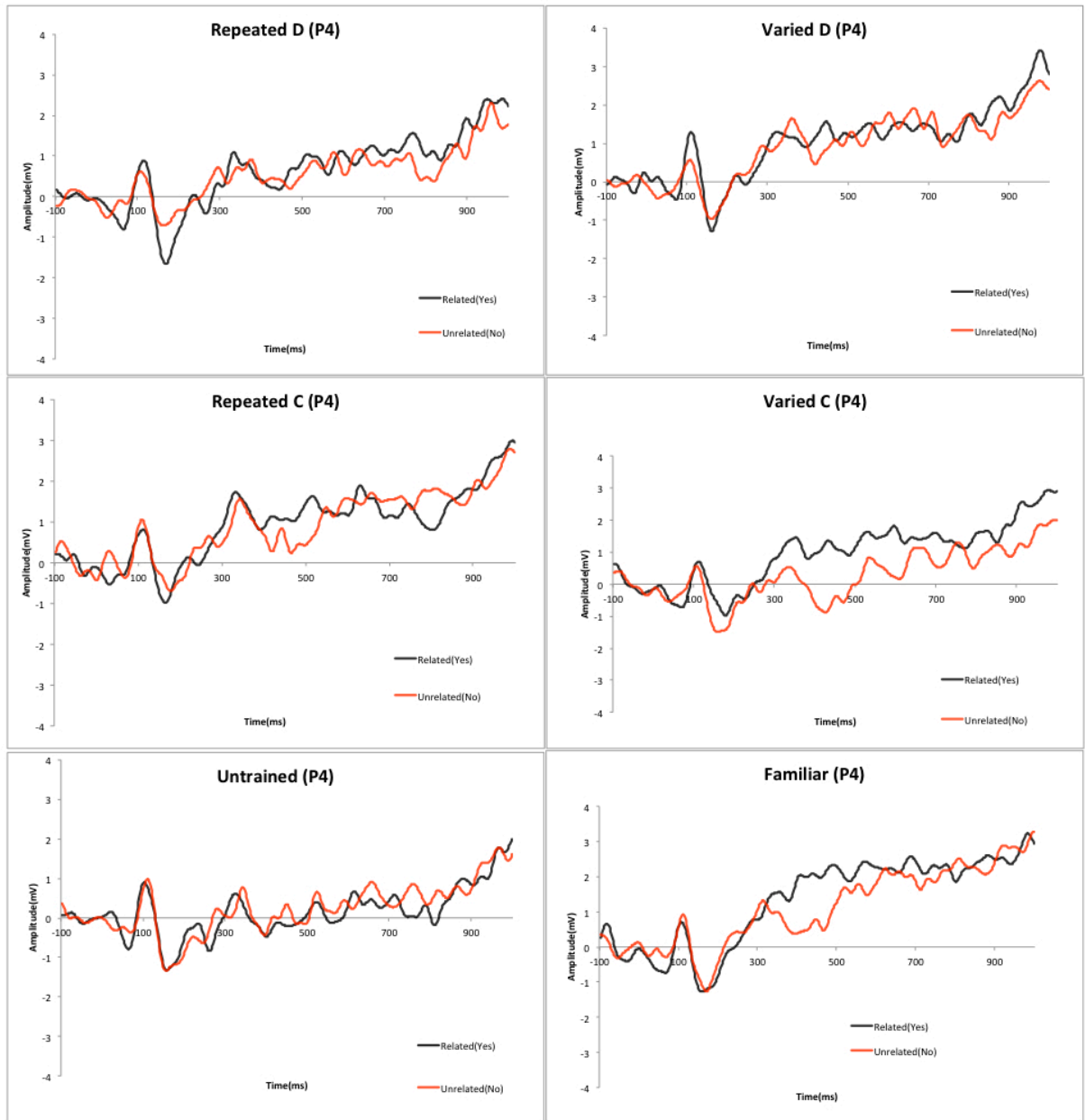
Figure 16. Experiment 1: Semantic judgment N400 relatedness effects at central-midline locations

4.4.2 Sentence Judgment Task: Final Word

The N400 is hypothesized to indicate meaning integration in single word presentations and sentence contexts. For this task, we predicted that if learners acquired the meaning of the words

that we would observe an N400 effect for contexts in which the final word is incongruent with the content of the sentence, and a reduction of this effect in contexts in which the final word is congruent. Visual inspection of the data indicated a disparity in latency to peak for the N400 among all word types at all electrode locations of interest. The latency to peak of the N400 for learning conditions occurred approximately at 500 ms and lasted 200 ms, whereas for untrained words, this occurred earlier, at 400 ms. Rodriguez-Fornells et al. (2009) reported a similar effect, and argued that the delay in onset latency of the most negative peak of the N400 was due to weak representations of the recently learned words. To adjust this disparity, an adjusted time window was used; mean amplitudes were averaged from 400 to 600 ms for the learning conditions, and mean amplitudes were averaged from 300 to 500 ms were for untrained words.

A word type (repeated C, repeated D, varied C, varied D, untrained) x congruency (congruent, incongruent) x lobe (frontal, central, parietal) x hemisphere (left, midline, right) ANOVA indicated a main effect of word type, $F (4, 14) = 9.37$, $p < .01$, but no significant main effect of congruency, $F (1,17) = 1.27$, $p = .275$, (congruent $M =1.78$, incongruent $M=1.66$). Bonferroni-corrected multiple comparisons indicated that the mean amplitudes for learned words were significantly more positive than for untrained words; repeated D = 2.11 repeated C = 1.93, varied D =1.78 varied C=1.96, and untrained = .81, $p < .01$. Learning conditions' mean amplitudes did not significantly differ from each other.

The congruency x hemisphere interaction was marginally significant, $F (2,16) = 3.56$, $p = .053$: left hemisphere locations, (congruent trials $M = 1.13$ and incongruent $M = 1.25$), for midline locations, (congruent trials $M = 2.04$ and incongruent $M = 1.74$), and for right locations, (congruent trials $M = 2.17$ and incongruent $M = 1.98$). The largest N400 magnitude (i.e.,

congruent trials–incongruent trials) was observed at midline locations ($M = .30$), whereas smaller magnitudes were observed for left ($M = -.12$) and right ($M = .19$) locations.

The word type x congruency x hemisphere interaction was also marginally significant, F $(8, 10) = 2.56$, $p = .083$. N400 magnitudes for each word type at each hemisphere location were computed, these are summarized in Table 7. Learners did not show a large N400 magnitude for

Table 7. Experiment 1: N400 congruency magnitude by word type and hemisphere location

	$p = .083$		
	Left	**Midline**	**Right**
Repeated D	-0.09	0.43	0.64
Repeated C	-0.77	-0.22	-0.10
Varied D	-0.26	0.83	-0.06
Varied C	0.27	0.74	0.52
Untrained	0.24	-0.30	-0.07

untrained words, therefore, there was no reduction of the N400 for congruent trials. For repeated C words, a reversed congruency effect was observed; N400 magnitudes were negative at all three hemisphere locations, indicating more positive amplitudes for incongruent trials than for congruent trials. This reversal effect for repeated C words was greatest at left locations, whereas modest magnitudes for all other word types were observed at this hemisphere. The largest N400 magnitudes for varied D and varied C trials were observed at midline locations, and at right locations for repeated D trials. These data show a similar pattern of hemispheric lateralization for the N400 that was been observed in the semantic-judgment task.

Our a priori hypothesis was that we would observe the largest N400 for congruency at midline electrode locations (see Borovsky et al., 2008 for a similar study). To test this hypothesis, and to follow up the results from the word type x congruency x hemisphere interaction, a word type x congruency ANOVA was completed for the midline hemisphere, and a pair-wise comparison for repeated D words at the right hemisphere location. The ANOVA

indicated a main effect of word type, F (4, 14) = 5.88, $p < .01$, indicated that mean amplitudes for learned words were significantly different than for untrained words. Bonferroni-corrected multiple comparisons indicated more positive amplitudes for repeated D (*M* = 2.16), repeated C (*M* = 2.02), varied D (*M* = 1.98), and varied C (*M* = 2.17) words that differed significantly from untrained words. The mean amplitudes for learned words did not differ significantly from each other. The main effect of congruency F (1, 17) = 2.56, $p = .13$, and word type by congruency interaction, F (4,14) = 2.39, $p = .10$ were not significant. Our data did not indicate any significant congruency effects, but they do show more positive N400 amplitudes for learned words than for untrained words. This suggests that learners did not have sufficient word knowledge to make an accurate congruency judgment, but they could differentiate a learned word from an untrained word.

A pair-wise comparison of congruent trials and incongruent trials at right hemisphere locations was performed to test for differences in congruency for the repeated-D condition, see Table 7. A marginal effect of congruency, t (17) = 1.76, $p = .097$, indicated a differences for congruent trials (*M* = 2.49) and incongruent trials (*M* = 1.80), suggesting a reduction of the N400 for repeated D words. Figure 17 and 18 illustrate the N400 congruency effect by word type at central and parietal midline locations.
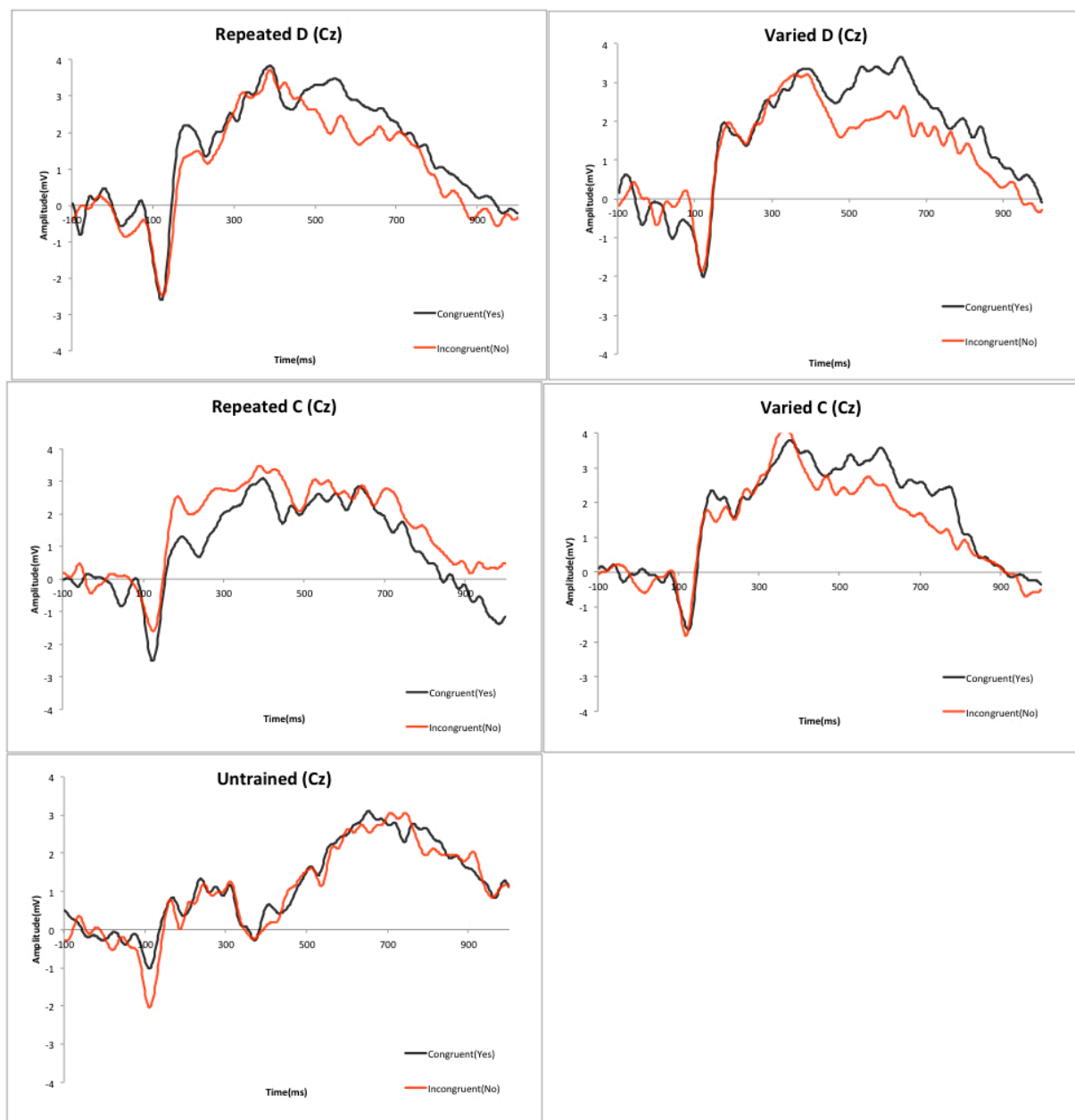
Figure 17. Experiment 1: N400 congruency effect by word type at central-midline locations
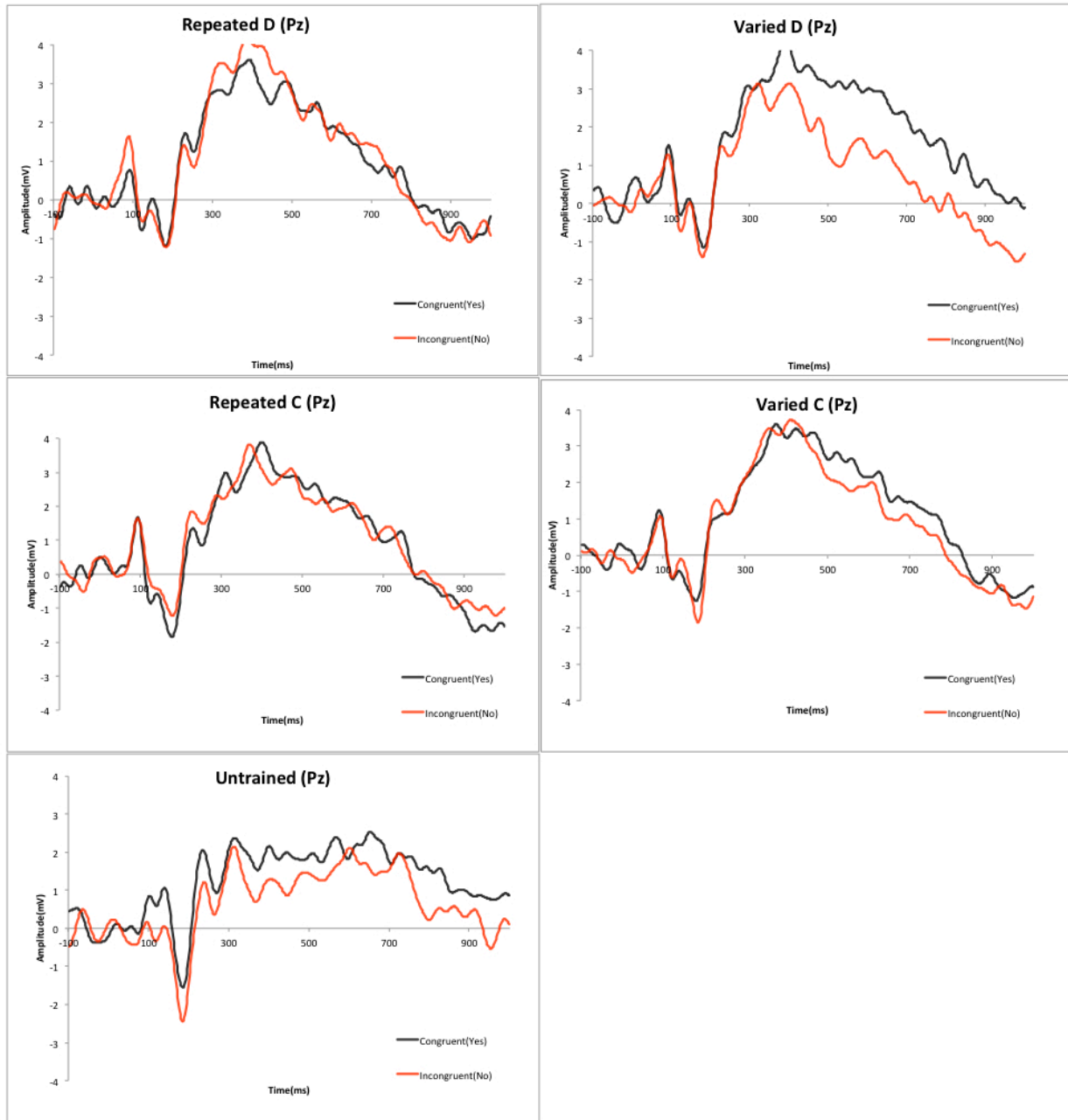
Figure 18. Experiment 1: N400 congruency effect by word type at parietal-midline locations

4.4.3   Individual Differences

To examine individual differences in the magnitudes of our FN400, P600, and N400 effects, we performed correlational analyses with each ERP effect and the individual differences measures from the lexical and comprehension battery.

4.4.3.1 FN400 Magnitude

Individual differences measures and the d-prime measures from the semantic judgment task were used in a correlational analysis with FN400 magnitudes (i.e., mean of untrained words subtracted from each mean of the other word types). FN400 magnitudes were used from each of the frontal hemispheres (F3, Fz, F4). No significant correlations were observed for any of the individual differences measures and FN400 magnitudes of each frontal hemisphere locations.

4.4.3.2 P600 Magnitude

Individual differences measures and the d-prime measures from the semantic judgment task were used in a correlational analysis with P600 magnitudes (i.e., mean of untrained words subtracted from each mean of the other word types). P600 magnitudes were used from each of the parietal hemispheres (P3, Pz, P4). No significant correlations were observed for any of the individual differences measures and P600 magnitudes of each parietal hemisphere location.

4.4.3.3 Semantic Judgment N400 Relatedness Magnitude

Our ANOVA analyses indicated that the greatest N400 magnitudes (related-unrelated) were observed at midline and right electrode locations, therefore, correlational analysis with individual

difference measures were performed with the magnitude of each word type at midline and right locations. A marginally significant correlation of author recognition and familiar word magnitude at midline hemisphere locations, $r = .414$, $p = .06$, indicated that better scores of text exposure correlated positively with the size of the N400 effect for familiar words. A marginally significant correlation of comprehension score and varied C magnitude at right hemisphere locations, $r = .404$, $p = .06$, indicated that better comprehension scores were correlated positively with the size of the N400 effect for varied C trained words. No other significant correlations were found.

4.4.3.4 Sentence Judgment N400 Congruency Magnitude

Our ANOVA analyses indicated a trend of congruency across word type at midline hemisphere locations as shown in table 7. We correlated the N400 congruency effect (congruent-incongruent) for each word type with all of the individual differences measures. A significant positive correlation of author recognition and varied C magnitude was found, $r = .574$, $p < .05$, indicating that the size of the varied C magnitude is related to the measure of text exposure. No other significant correlations were found.

4.5   RESULTS SUMMARY AND CONCLUSIONS

4.5.1   Behavioral Data

Performance on the semantic judgment and the sentence judgment task indicated an advantage for context conditions. When learners made decisions about the relatedness of the target word to

a single word in the semantic judgment task, faster reaction times were observed for repeated C trials. For accuracy, learners were more accurate for words learned with varied contexts, whereas their accuracy performance did not differ for words learned with the repeated D, repeated C, or varied D conditions. When learners were making decisions about the congruency of a learned word in a new context in the sentence decision task, the same advantage for varied C trials was observed. When accuracy performance was compared to untrained words, learners performed significantly better on contextual decisions for the varied C condition.

These data suggest that for meaning decisions for single words and sentences, learning a new word with a sentence context is better than learning with a definition. Variability for context conditions in the semantic-judgment was not a factor affecting performance because learners performed faster with repeated C words and more accurately with varied C words. However, variability is a factor when making a contextual decision on the sentence judgment task. Varied contexts provide learners with more instances of how the word can be used in context, whereas a single-repeated context provides the learner with one of these instances. Therefore, more contextual instances yield better performance for contextual decisions.

As a measure of decontextualized meaning knowledge, the definition generation task indicated that learners generate more accurate definitions for words learned with dictionary definitions than with sentence contexts. These data also indicated that varied learning conditions were better than repeated conditions. For the definition conditions, we examined the number of words trials for which learners generated a verbatim definition from the content that was encountered in learning. For repeated D trials, 40% of the definitions contained verbatim information, and for varied D trials, 57% of the definitions contained verbatim information. This

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suggests that learners did remember a substantial portion of the definitions from the learning

phase, and that this may also account for better accuracy for these trials.

4.5.2   ERP Data (4.5.2)

Table 8 summarizes the significant ERP effects and trends for all word types across tasks. Two

N400 effects were measured in these data, a relatedness effect for semantic judgment and a

congruency effect for sentence judgment; these are referred to as N400-related and N400-

congruent, respectively. The effects for the FN400, N400-related, and N400-congruent refer to

the reduction of the N400 negative amplitude from 300 to 500 ms either for familiarity or

meaning congruence. The P600 effect refers to greater positivity from 500 to 700 ms. Boxes

that are marked with a '+' indicate a significant effect, boxes that are marked with a '-' indicate a

trend, boxes that are blank indicate neither.

Table 8. Experiment 1: Summary of ERP effects

ERP Effects for Experiment 1				
	FN400	**P600**	**N400-relate**	**N400-congruent**
Repeated D	+	-		-
Repeated C				
Varied D		-		-
Varied C	+	-	-	-
Untrained				
Familiar			+	

Our first hypothesis for this experiment was that differences in context type and

variability would result in episodic memory traces that differ in strength, and that these

differences would affect familiarity and recognition. However, our results did not indicate an

effect of type for familiarity. The FN400, which is an index of familiarity, was significantly

reduced for repeated D and varied C trials when compared to the mean amplitude of untrained words. Furthermore, this effect was not modulated by the variability of content, either; the magnitude of the FN400 for repeated D (.90) and varied C (.88) trials was about the same. This effect suggests that the FN400 is modulated by meaning knowledge. Specifically, the varied C condition facilitates the process of abstracting a word's meaning, whereas a repeated definition reinforces and strengthens the core meaning features of the word. These results confirm Gernsbacher's (1984) argument that word familiarity is a product of orthographic and meaning knowledge. For example, in our experiment, familiar words for which learners know the meaning, also showed a large FN400 reduction ($M = .71$). The repeated C condition may be at a disadvantage because it does not facilitate the process of abstracting word meaning as well as varied contexts. The presentation of definitions in the Varied D does present the learner with the meaning features of the word, however, these features are not strengthened with multiple encounters, and this may result in weaker meaning representation. In this case, the meaning representation may be diffuse with multiple features that are weak.

These data did indicate a trend for P600 old/new effects; repeated D, varied D, and varied C words were more positive than untrained and familiar words that did not appear during learning. However, the trend that was observed for the P600 did not include all words that were encountered during learning, repeated C words showed more negative amplitudes. Repeated C amplitudes were as negative as the new words (familiar and untrained). This suggests that a single-repeated context is a weak learning episode of a word, thus affecting both familiarity and recognition processes.

Our second hypothesis for this experiment was that context type and variability would result in differences in meaning acquisition. Specifically, we predicted that varied contexts

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would result in better learning of a word's meaning than single-repeated contexts and definitions. Meaning acquisition was measured in two ways; in a new single word and in new sentence contexts that differed from those that were encountered during learning. In a single word context, we observed a trend for varied C words with a reduction of the N400 for related trials, indicating that learners had acquired some aspects of the word's meaning. As predicted, a significant robust reduction of the N400 was observed for related trials in the familiar words. Interestingly, for definition conditions no N400 effects were observed. As indicated by the definition generation data, learners are not failing to remember definitions because they generated verbatim information for approximately 50% of the trials. This suggests that having knowledge of a word's core meaning features without any contextual information does not result in a meaning representation that also contains relational information about the target word to other words. Miller (1999) indicates that a part of a word's meaning representation is meta-linguistic information about the word's semantic relationship to other words (e.g., synonym, antonyms, etc), and perhaps, learning words with dictionary definitions does not facilitate the development of this knowledge.

Results from the sentence judgment task do indicate a trend that definitions can be applied to make contextual decisions about a word. A reduction of the N400 for congruent trials was lateralized at midline and right locations for repeated D and varied D words. Larger N400 magnitudes (.83) were observed for varied D trials than for repeated D trials (.64), and furthermore, the magnitude of the effect for these trials was as large as for the varied C trials (.74). For repeated C trials, no reduction of the N400 was observed. The effect for varied C trials does suggest that multiple encounters of varied content do facilitate the abstraction of a word's meaning, but having greater contextual knowledge of how a word is used in context may

not be an advantage. Varied D and repeated D words showed the same reduction of the N400 for congruent trials without the additional contextual information about word use. These trends suggests that a meaning representation of a word's core meaning features may be sufficient to make contextual decisions about a learned word in a new context. Repeated C trials consistently do not indicate any effects for meaning acquisition; they neither facilitate the abstraction of word meaning nor do they present the learner with a variety of contextual information that the learner may be able to use compensate for the lack of meaning knowledge.

4.5.3   Individual Differences (4.5.3)

Correlations with behavioral and ERP data indicated that vocabulary and text exposure were highly correlated with performance, especially for the varied C condition. Scores from the vocabulary and author recognition task were correlated with faster reaction times and more accurate responses for the semantic judgment and sentence judgment tasks. Further, correlations with N400 magnitudes for relatedness and congruency indicated a positive relationship with vocabulary and text exposure. These results correspond to other word learning studies that indicate learners who have more vocabulary knowledge also tend to be more successful at learning new word meaning from context (Cain, Oakhill, & Lemmon, 2004).

5.0   EXPERIMENT 2: SEMANTIC CONSTRAINT AND VARIABILITY

5.1   OVERVIEW

Our theoretical framework (Reichle & Perfetti, 2003) makes a general assumption that encoded memory traces of word experiences can vary in strength, quality, and quantity. Experiment 2 tests this assumption by manipulating the semantic constraint and the variability in which a new word is encountered. For this experiment, this assumption about encoded memory traces of words makes two predictions about the effects of semantic constraint and variability on meaning acquisition, and subsequent encounters with the words.

Vocabulary learning studies with adults have shown that the semantic constraint of a sentence context directly affects meaning acquisition (Bolger et al., 2008; Daneman & Green 1986) and encoding (Chaffin, et al., 2001; Williams & Morris, 2004). Highly constraining contexts, which are supportive of the word's meaning, are better for learning a new word's meaning than low constraint sentences. Chaffin et al. argues that greater cognitive effort is involved in processing a highly constraint context, which results in deeper encoding of the word. According to the word-instance framework, deeper encoding of a word's meaning would result in stronger memory traces for high constraint sentences than for low constraint sentences. Our first prediction is that to the extent that word knowledge modulates familiarity, we expect that learners would be more familiar with words learned with high than low constraint sentences.

Further, because high constraint sentences are more supportive of a word's meaning than low constraint sentences, we also expect to observe superior learning of meaning with high constraint sentences.

As addressed in Experiment 1, we are also interested in whether memory strength depends on the quantity (the sum of all traces) or the cumulative strength of repeated traces. The results from Experiment 1 indicated that familiarity and recognition were modulated by the availability of meaning knowledge, rather than by the sum or the cumulative strength of the memory traces. We test this hypothesis again by presenting learners with high or low constraint sentences in either varied or repeated contexts. Our second prediction is that high constraint sentences would be more familiar than low constraint sentences because high constraint sentences allow for a deeper encoding of the word. Specifically, if the quantity of traces affects familiarity, than varied high constraint sentences will be better than repeated high constraint contexts. If only the strength of the traces affects familiarity, then conditions with single-repeated contexts will be better than varied contexts.

Thus, the objective of Experiment 2 is to examine the effects of semantic constraint (high or low) and variability (varied or repeated content) on meaning acquisition and word processing. The following two hypotheses are addressed in this experiment:

> (1) The degree of semantic constraint in which a word has been encountered will result in episodic traces that differ in strength, therefore affecting familiarity and meaning acquisition. Specifically, the effects of familiarity will be observed by differences in FN400 amplitudes, and the effects of meaning acquisition will be observed by differences of N400 amplitudes.

(2) Contextual variability will affect the strength and quantity of memory traces encoded at learning, therefore, having differential effects on word recognition processes and meaning acquisition. Specifically, the effects of recognition will be observed in differences in P600 amplitudes, and the effects of meaning acquisition will be observed by differences in N400 amplitudes.

5.2   METHODS

5.2.1   Participants

21 right-handed individuals were recruited for the study from the large lexical and comprehension battery database. These learners represented a broad range of ability on comprehension, vocabulary, and lexical skill. Participants were compensated $10/hour for their participation for the 4-hour long study. Five learners were eliminated from the final analyses due to unusable EEG data.

5.2.2   Procedure

All learners completed the three phases of the experiment; working memory assessment, word learning, and word testing.

5.2.3 Design: Word learning

In Experiment 2, the semantic constraint (high or low constraint) and the variability (varied or repeated) of word information were manipulated to test the effects of word experience on meaning acquisition and processing. This 2 x 2 design yielded four different learning conditions, as described below. The learning trial presentation was quasi-random; trials were intermixed from all four learning conditions but in a predetermined order to maintain a range of 5 to 10 trials between the first learning trial and subsequent learning trials for all words.

5.2.4 Learning Conditions

5.2.4.1 Repeated High Semantic Constraint (repeated-hi condition)

In this learning condition, learners were presented with a single-repeated sentence context of high semantic constraint (i.e., scores above 0.6 on the cloze task). The same sentence was repeated across all four learning trials. For all trials of this condition, the target word appeared on the top of the computer screen, with the sentence displayed below. A blank replaced where the target word would appear in the sentence to control for frequency of target word presentation.

5.2.4.2 Repeated Low Semantic Constraint (repeated-lo condition)

In this learning condition, learners were presented with a single-repeated sentence context of low semantic constraint (i.e. scores below 0.3 on the cloze task). The same sentence was repeated across all four learning trials. For all trials of this condition, the target word appeared on the top of the computer screen, with the sentence displayed below. A blank replaced where the target word would appear in the sentence to control for frequency of target word presentation.

5.2.4.3 Varied High Semantic Constraint (Varied-hi condition)

In this learning condition, learners were presented with four different single sentence contexts of high semantic constraint, one for each learning trial.

5.2.4.4 Varied Low Semantic Constraint (Varied-lo condition)

In this learning condition, learners were presented with four different single sentence contexts of low semantic constraint, one for each learning trial.

5.3   RESULTS: BEHAVIORAL MEASURES (5.3)

5.3.1   Comprehension, Vocabulary, and Lexical Skill Assessments

Table 9 summarizes the assessment scores for the 16 participants whose behavioral and EEG were analyzed.

Table 9. Experiment 2: Individual differences measures

Measure	Mean	SD
ND-Comp	19.28	5.98
ND-Vocab	43.0	19.94
Real Word d'	2.17	1.12
Spelling d'	1.96	0.41
PhaT	0.79	0.11
Author d'	2.26	1.40
Raven's	7.31	4.19

5.3.2 Working Memory Assessment

5.3.2.1 OSPAN

Learners averaged 48.14 (SD = 12.99) correctly recalled words out of 60 items on the memory task, with an average set size span of 4.09 (SD = 1.44). For the operations task, learners averaged 27.71 (SD = 9.40) of the 60 operations correctly, with an accuracy of 45% correct. From the 22 learners who completed the task, only one had an accuracy of 83%. Given the low accuracy scores on the operations task and the high scores on the word recall task, there is a reasonable certainty that the learners prioritized the word recall task over the operations task. Therefore, learners' performance on the OSPAN task did not represent a true measure of working memory; these scores were not used in any analyses.

5.3.2.2 RSPAN

Learners averaged 52.87 (SD = 7.06) correctly recalled words out of 60 items on the word memory task, with an average set size span of 4.5 (SD = 4.35). For the sentence comprehensibility task, learners averaged 4.78 (SD = 4.35) of the 60 sentences correctly, with an accuracy of 7.96% correct. Given the low accuracy scores on the sentence comprehensibility task and the high scores on the word recall task, there is a reasonable certainty that the learners prioritized the word recall task over the sentence task. Therefore, learners' performance on the RSPAN task did not represent a true measure of working memory; these scores were not used in any analyses.

5.3.3   Initial Familiarity Check

The initial familiarity check results for Experiment 2 were similar to the findings from Experiment 1. Over half of the learners were familiar with the word 'fruition' (i.e., 55%), and half (i.e., 50%) were familiar with the word 'platitude'. Using the same procedure from Experiment 1, these words were eliminated from all of the analyses to avoid confounds with the experimental manipulations. For the remaining target words, the percentage of learners that indicated familiarity with any of the target words ranged from 0.05 to 15%.

5.3.4   Learning

In Experiment 2, learners were exposed to high or low semantic constraint context sentences; half of which repeated the same information over four learning trials, and half of which varied the information over four learning trials. To examine condition and trial effects, and to verify that the learners were not bypassing repeated learning trials after their first exposure, a learning condition (repeated-hi, repeated-lo, varied-hi, varied-lo) x learning trial (first, second, third, fourth) ANOVA was completed on the time in milliseconds that each learner spent on any given learning trial. Results indicated a main effect of learning condition, $F (3, 18) = 16.20$, $p < .01$, a main effect of learning trial, $F (3, 18) = 43.06$, $p < .01$, and learning condition x learning trial interaction, $F (9, 12) = 3.13$, $p < .05$. Learners spent more time studying varied context trials ($M = 6309.62$ ms for varied-hi and $M = 6898.07$ ms for varied-lo) than repeated trials ($M = 4452.11$ ms for repeated-hi and $M = 4876.44$ ms for repeated-lo). As indicated by the learning trial main effect, learners spent more time on the first learning trial, $M = 7804.97$ than the second ($M = 5536.51$ms), third ($M = 4825.01$ms), or fourth ($M = 4370.28$ ms). As indicated

in Figured 19, regardless of learning condition, most time was spent on the first learning trial. The times spend on subsequent learning trials (second, third, and fourth) were not statistically different from each other.
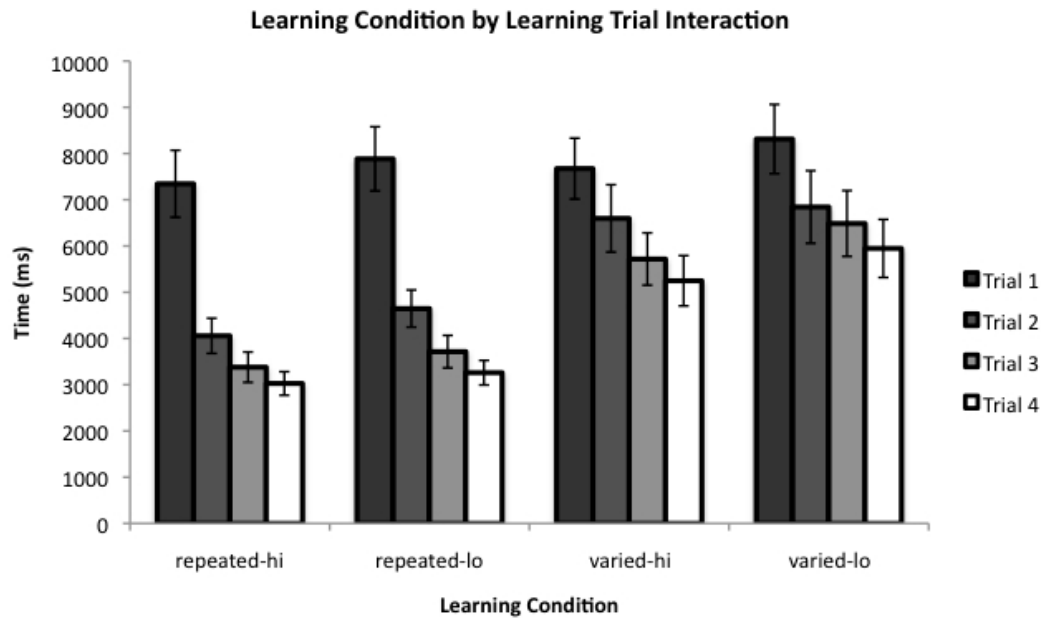
Figure 19. Experiment 2: Trial learning effects

5.3.5   Semantic-relatedness judgment task

5.3.5.1 Reaction Time: Correct Trials Only

A word type (repeated-hi, repeated-lo, varied-hi, varied-lo, familiar, untrained) x relatedness (related, unrelated) ANOVA revealed main effects of word type, F (5, 11) = 3.99, $p < .05$ and relatedness, F (1, 15) = 5.11 $p < .05$. Learners were faster to respond to familiar words than untrained words and learned words (repeated-hi, repeated-lo, varied-hi, varied-lo).   Decision times for familiar words were 80 ms faster on average than for untrained ($M = 903.60$), repeated-

hi (M =911.30), repeated-lo (M =886.02), varied-hi (M= 896.48), and varied-lo (M= 903.60) words. Overall, learners were faster to respond to related 'yes' trials (M = 859.54) than unrelated 'no' trials (M = 904.27). The interaction of word type and relatedness was not significant.

5.3.5.2 Accuracy

Accuracy performance for the semantic judgment task is summarized in Figure 20. An analysis of word type (repeated-hi, repeated-lo, varied-hi, varied-lo, familiar, untrained) x relatedness (related, unrelated) revealed main effects of word type, F (5, 11) = 39.79, $p < .01$, and relatedness, F (1, 15) = 9.48 $p < .01$. Learners were most accurate for familiar words (M = .86) and least accurate for untrained words (M =. 51). Bonferroni-adjusted post-hoc comparisons indicated that both familiar and untrained words differed significantly than learned words. For learned words, learners were most accurate for varied-hi words, (M = .63) which differed significantly than the accuracy for repeated-lo words (M = .58). Accuracy for repeated-hi (M=. 61) and varied-lo (M = .61) words did not significantly differ from varied-hi or repeated-hi words. Overall accuracy performance was better for related trials (M = .66) than for unrelated trials (M = .60).

The word type x relatedness interaction was also significant, F (5, 11) = 10.18, $p < .01$. Learners were more accurate for related than unrelated varied-hi t (15) = -5.57, $p < .01$, and varied-lo, t (15) = -3.49, $p < .01$words. Accuracy differences for related and unrelated trials for familiar words approached significance, t (15) = -1.89, $p = .078$. As observed in Experiment 1, accuracy for untrained words indicated a "no" bias. Learners were significantly more accurate for unrelated (M = .61) than for related (M = .41) trials, t (15) = 4.12, $p < .01$. These results are illustrated in Figure 20.
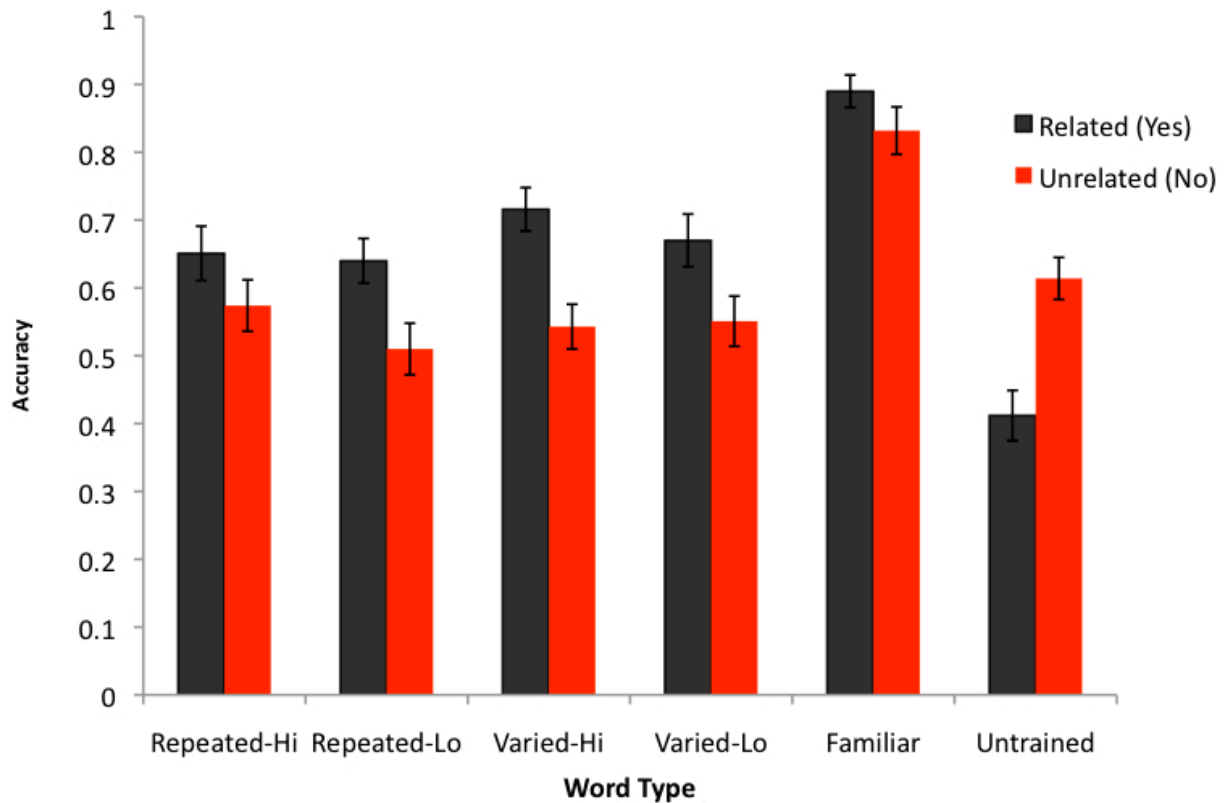
Figure 20. Experiment 2: Word type by relatedness effects for accuracy

5.3.6   Sentence Decision Task

As in Experiment 1, accuracy performance was of more interest than the decisions times because the paradigm employed a delayed response. A word type (repeated-hi, repeated-lo, varied-hi, varied-lo, untrained) x congruency (congruent, incongruent) ANOVA indicated a significant interaction of word type and congruency, F (4, 11) = 6.16, p < .01; Figure 21 illustrates this interaction.

Pair-wise comparisons indicated that for untrained words, learners exhibited a "no" bias, t (14) = 4.62, p < .01. Learner were more accurate for incongruent (M = .74) than for congruent (M = .47) trials. This effect has been consistently observed across both experiments and tasks for

untrained words, indicating that learners are biased to respond 'no' to words that are unfamiliar. A trend for repeated-hi words, t (14) = -2.07, p =0.06, showed that learners were more accurate for congruent (M = .70) than incongruent (M = .58) trials.
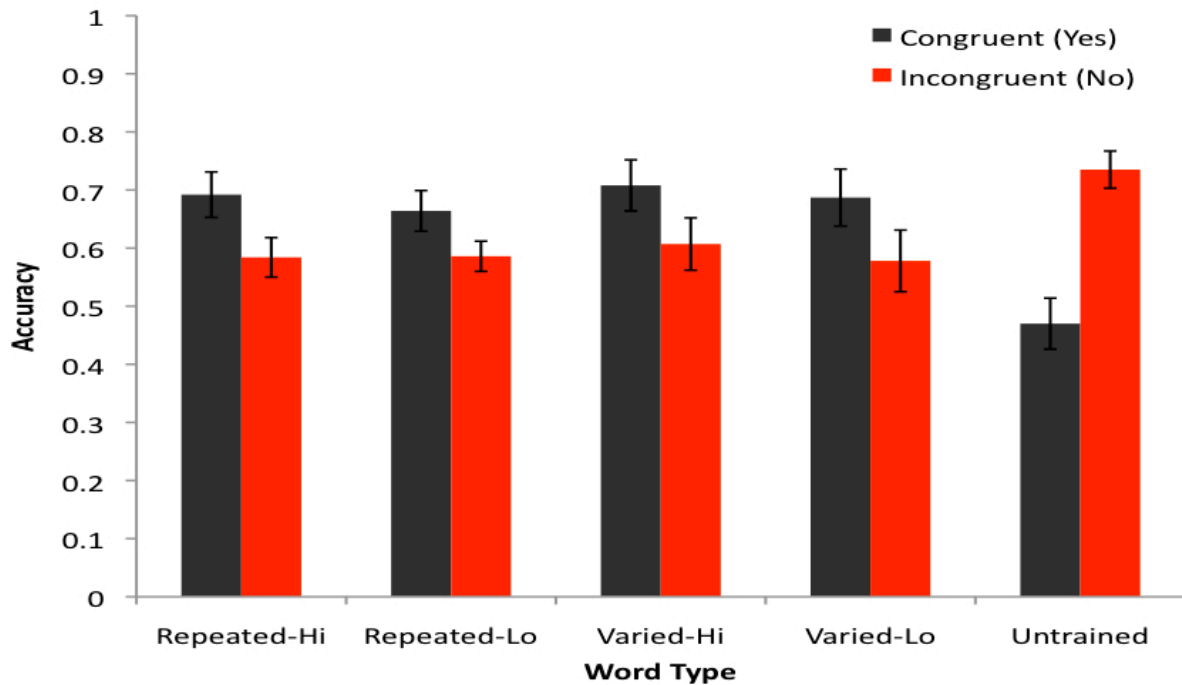
Figure 21. Experiment 2: Word type by congruency effects for accuracy

5.3.7 Definition Generation

Learners' definition generation scores were averaged to generate a final accuracy score for each condition. A constraint (high, low) x variability (repeated, varied) ANOVA indicated a main effect of constraint F (1, 18) = 9.33, p < .01, and a main effect of variability F (1, 18) = 6.95, p < .05. Learners were more accurate in generating definitions for words learned with high constraint sentences (M= .46) than with low constraint sentences (M = .38). Words presented in

varied sentences ($M = 0.45$) generated more accurate responses than words presented in repeated sentences ($M = 0.38$).

5.3.8 Individual Differences Measures

Individual assessment scores from our lexical and comprehension battery were correlated with each behavioral measure from the three tasks. Additionally, d-prime scores were computed for the semantic and sentence judgments tasks, and were added to the correlation analysis as an individual difference measure.

5.3.8.1 Semantic Judgment Task: Reaction Time and Accuracy

Correlations with the decision time performance for the semantic judgment task indicated significant correlations for varied-hi and varied-lo conditions with the d-prime scores for the real word test. Negative correlations for repeated-hi words ($r = -.668$, $p < .01$) and varied-hi ($r = -.546$, $p < .05$) words indicated that faster reaction times were related to greater sensitivity on the real word test. No other significant correlations were found.

Significant correlations for accuracy performance are summarized in Table 10. Higher scores on lexical skills such as spelling and phonological awareness were correlated positively with more accurate responses for all learning conditions. Vocabulary skill was related to better accuracy for repeated-lo, varied-lo, and especially for varied-hi words. These correlations indicate that orthographic, phonological, and semantic knowledge is related to more accurate performance for all learning trials.

Table 10. Experiment 2: Correlations of individual differences and accuracy for the semantic judgment task

Measure	Repeated-hi	Repeated-lo	Varied-hi	Varied-lo	Familiar	Untrained
ND-Comp	-.044	.236	.304	.375	.226	.342
ND-Vocab	.429	**.602***	**.749****	**.546***	.444	.310
Real Word	.375	.413	-.290	**.546***	-.331	.504
Spelling	**.699****	**.627****	**.541***	**.555***	**.529***	**.539***
PhaT	**.589***	**.718****	**.665****	**.693****	.408	.380
Author	**.574***	.095	-.005	-.174	.456	-.113
Raven's	.146	.241	-.094	.030	.387	-.098

N =16, ** Correlation is significant at the .01 level
* Correlation is significant at the .05 level

5.3.8.2 Sentence Judgment Task: Accuracy

Accuracy performance on this task did not indicate significant correlations with vocabulary skill, but significant correlations were observed with orthographic and phonological awareness skills. Positive correlations with spelling, $r = .569$, $p < .05$, and PhaT, $r = .645$, $p < .05$ were observed for repeated-hi words.   Better performance on these skills was related to more accurate performance for these words. The PHaT was also positively correlated with the varied learning conditions, varied-hi ($r = .604$, p < .05) and varied-lo ($r = .592$, $p < .05$). Better phonological awareness was related to more accurate responses for varied learning trials.

5.3.8.3 Definition Generation

As illustrated in Table 11, definition generation accuracy was related to comprehension, vocabulary, phonological awareness, and general intelligence.   Higher scores on the comprehension test were related to more accurate definitions for all learning conditions. Correlations with the real word test and the PHaT indicate a dissociation of decoding skills and phonological awareness across the learning conditions. Decoding skills, as measured by the real word test was related to more accurate definitions for all learning trials. However, phonological awareness as measured by the PHaT, was related only to more accurate definitions for the varied conditions.

Additionally, our measure of general intelligence was related to definition generation accuracy for high constraint conditions (repeated-hi $r = .53$, $p < .05$ and varied-hi $r = .67$, $p < .01$). The Raven's matrix is a test of general non-verbal ability, and in this case, it may indicate a general ability to infer meaning from context.

Table 11. Experiment 2: Correlations of definition generation and individual differences

Measure	Repeated-hi	Repeated-lo	Varied-hi	Varied-lo
ND-Comp	.710**	.506*	.615**	.486*
ND-Vocab	.482*	.314	.487*	.638**
Real Word	.711**	.498*	.725**	.616**
Spelling	.111	-.154	.290	.091
PhaT	.380	.352	.584**	.600**
Author	.166	-.079	.296	.292
Raven's	.531*	.409	.671**	.159

N =19, ** Correlation is significant at the .01 level
* Correlation is significant at the .05 level

For Experiment 2, we followed a similar protocol of ERP analyses as was used in Experiment 1. The mean amplitudes for the three ERP components were of interest; the FN400, the P600, and the N400 were measured using 200 ms time windows appropriate for each of component. Data were averaged at nine electrode clusters based on the standard 10-20 electrode placement system as illustrated in Figure 6.

5.4.1   Semantic Judgment Task: Word 1 300 to 500ms

The FN400 is hypothesized to index familiarity of old versus new items, and the reduction of its negative amplitude is modulated by two factors. As previously mentioned, FN400 amplitude is affected by memory strength via repetition (Finnigan et al., 2002); for example, a greater reduction for the FN400 should be observed in repeated contexts than in varied contexts when the number of exposures is controlled. Further, to the extent that familiarity is also affected by the availability of meaning knowledge (e.g., Gernsbacher, 1984), FN400 amplitude reductions should also be observed for words learned in high constraint contexts that facilitate the acquisition of meaning better than low constraint contexts. Our a priori hypotheses were that variability (repeated or varied) and semantic constraint (high or low) would produce memory traces that differ in strength, and that these differences would be measurable by the FN400.

An omnibus ANOVA of word type (repeated-hi, repeated-lo, varied-hi, varied-lo, familiar, untrained) x lobe (frontal, central, parietal) x hemisphere (left, midline, right) did not indicate a significant effect of word type, $F (5, 15) = 1.46$, $p = .272$; repeated-lo $M = .038$,

repeated-hi $M = -.18$, varied-hi $M = -.37$, varied-lo $M = -.33$, untrained $M = -.49$, and familiar M

$= -.17$. No significant interactions with lobe or hemisphere were found.

Our a priori hypothesis was that the largest differences for the FN400 would be located in frontal electrodes, therefore, we replicated the same analyses with frontal electrode locations only, i.e., a word type (repeated D, repeated C, varied D, varied C, familiar, untrained) x frontal lobe (F3, Fz, F4). The main effect of word type $F\ (5,12) = .46$, $p = .80$, and the interaction of word type x lobe $F\ (10,7) = .251$, $p = .12$ were not significant. The main effect of lobe, $F\ (2,15) = 7.96$, $p < .01$ indicated differences in mean amplitude across all word types for frontal lobe locations. Bonferronni-adjusted multiple comparisons indicated more positive amplitudes at frontal-left $M = .75$ and at frontal-midline $M = .96$ locations than for frontal-right $M = .25$ locations, $p < .01$.

To examine the trends of the FN400 at these frontal locations, we computed the magnitude of the FN400 by subtracting the mean amplitude of untrained words from the mean amplitudes of each of the learning conditions and familiar words at each frontal hemisphere location. Table 12 summarizes the FN400 magnitude for each word type and frontal hemisphere location. These magnitudes indicate that the FN400 effects are lateralized at left and midline

Table 12. Experiment 2: FN400 magnitude by word type and hemisphere

	FN400 Magnitude		
	Frontal-Left	Frontal-Midline	Frontal-Right
Repeated-hi	0.87	0.55	0.14
Repeated-lo	0.78	0.62	0.22
Varied-hi	0.39	0.22	0.20
Varied-lo	0.47	0.37	0.20
Familiar	0.20	0.23	0.27

locations. Further, of the learned conditions, FN400 magnitudes were largest for repeated-hi and repeated-lo words, whereas the smallest magnitudes were observed for familiar words. These

trends suggest the possibility that the FN400 was modulated by repetition rather than meaning availability; repetition for both constraint conditions yielded greater magnitudes than for varied and familiar conditions where meaning information is more readily available. Figures 22, 23, and 24 show the ERP waveforms for the FN400 at the three frontal hemisphere locations along with bar graphs showing the amplitude of each word type from 300 to 500 ms.
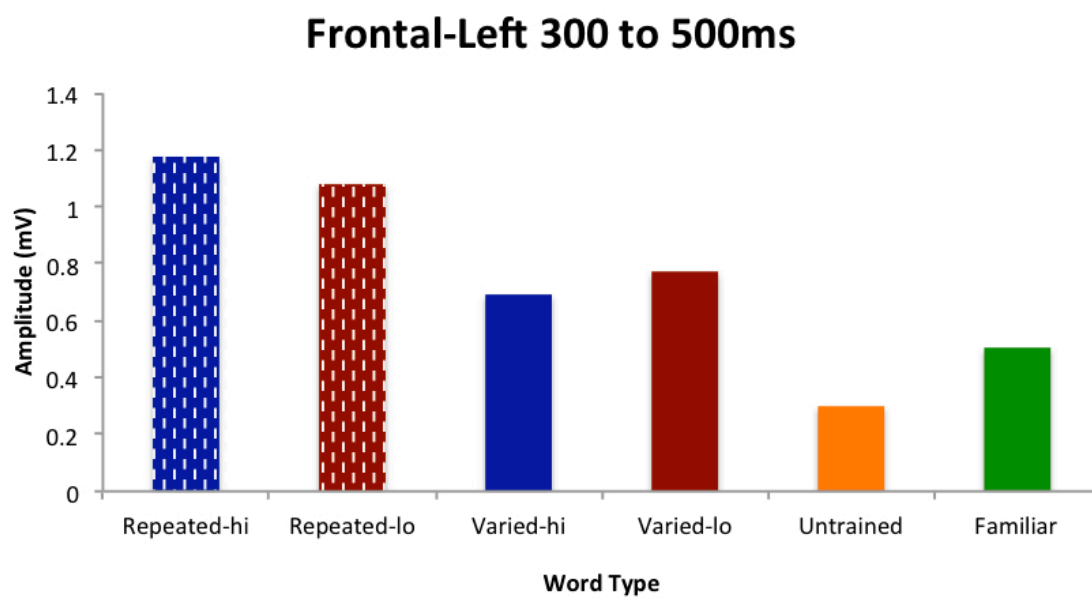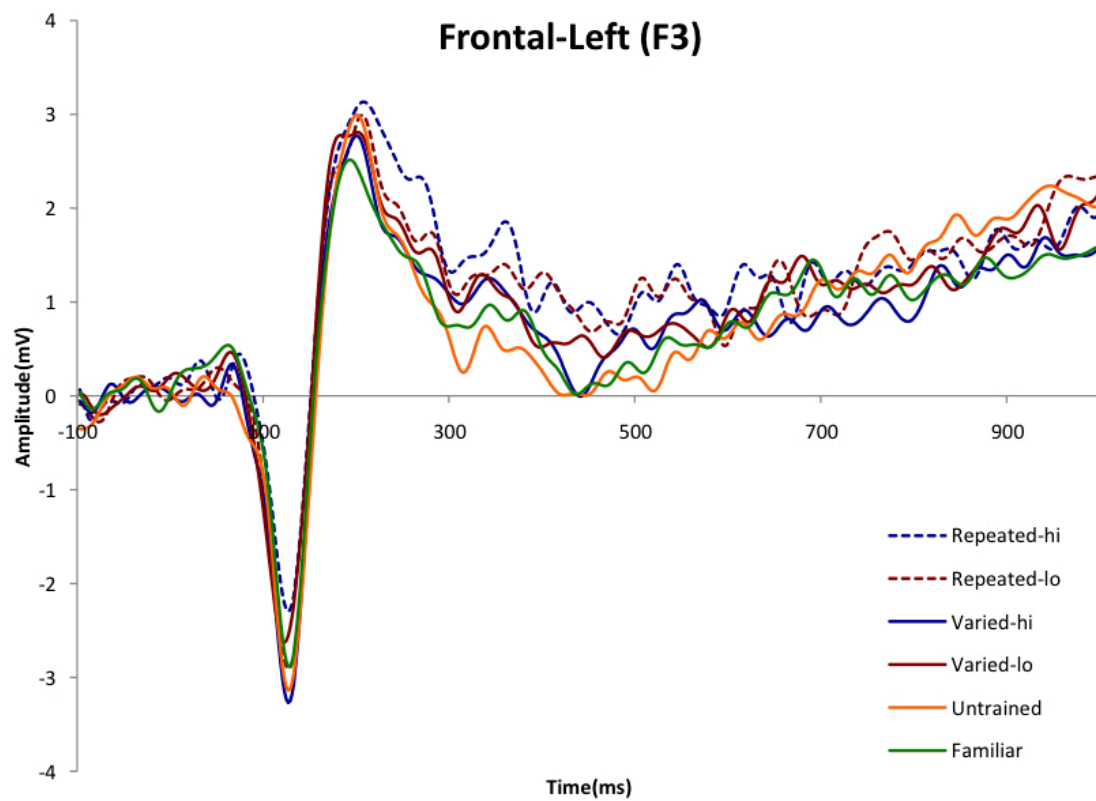
Figure 22. Experiment 2: FN400 effects at frontal-left locations
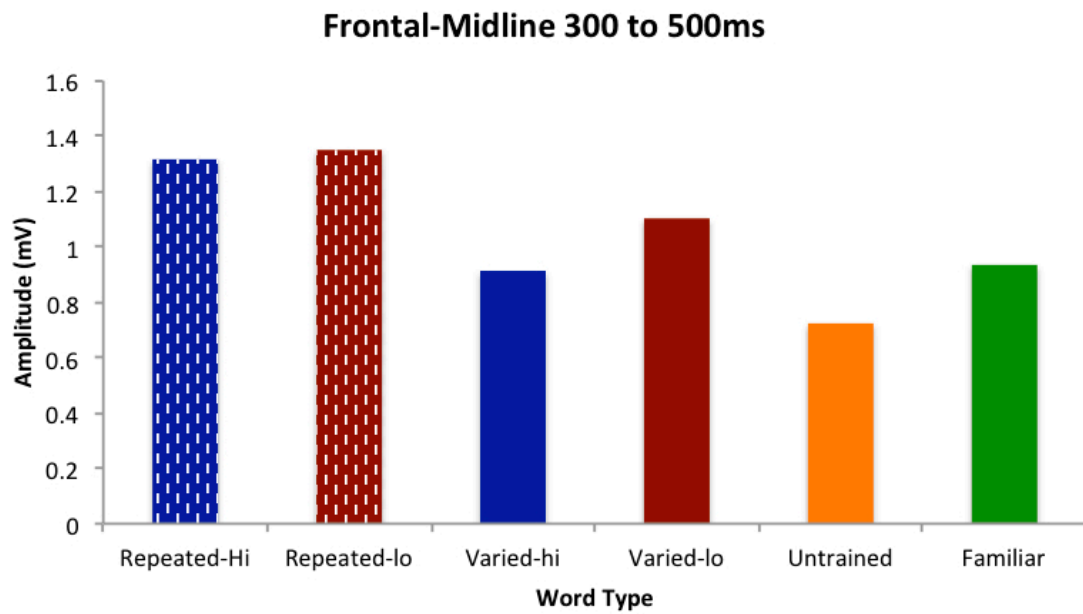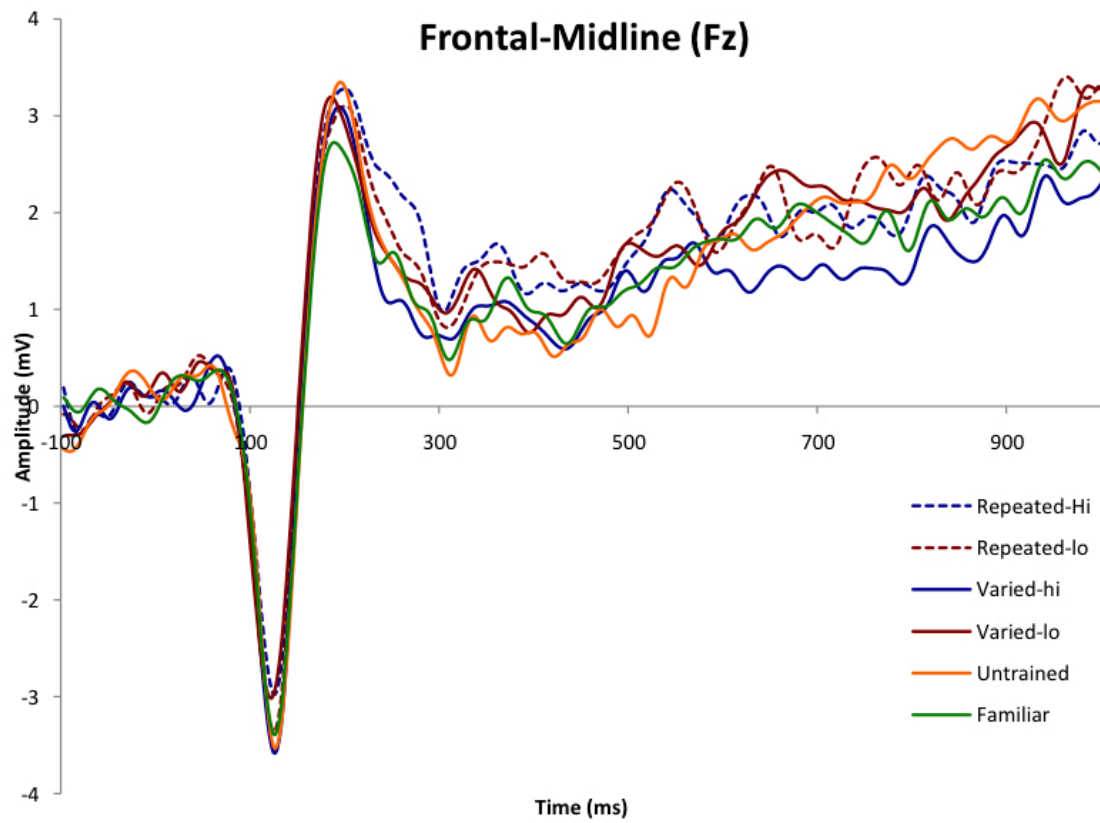
Figure 23. Experiment 2: FN400 effects at frontal-midline locations

Frontal-Left (F4)

Frontal-Right 300 to 500ms
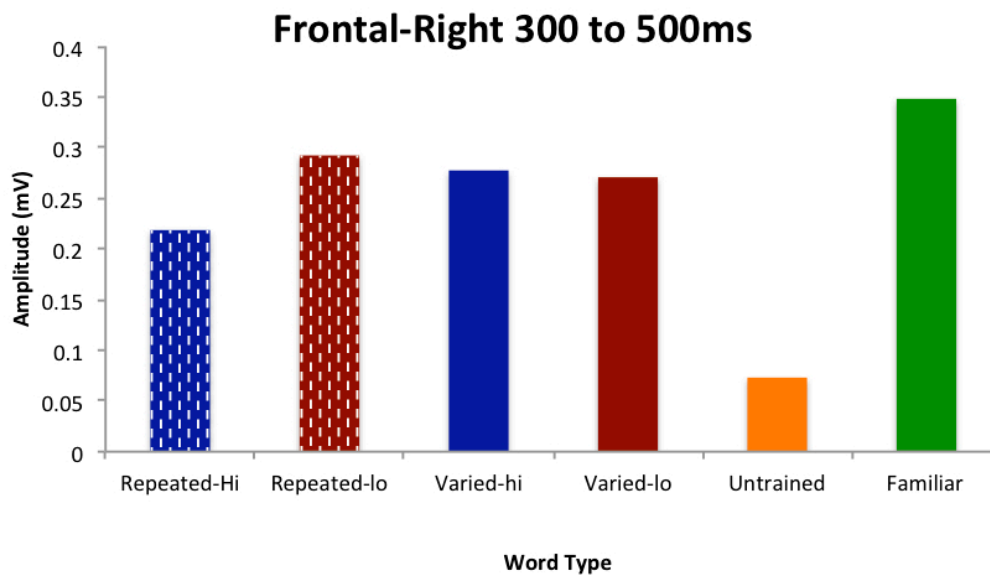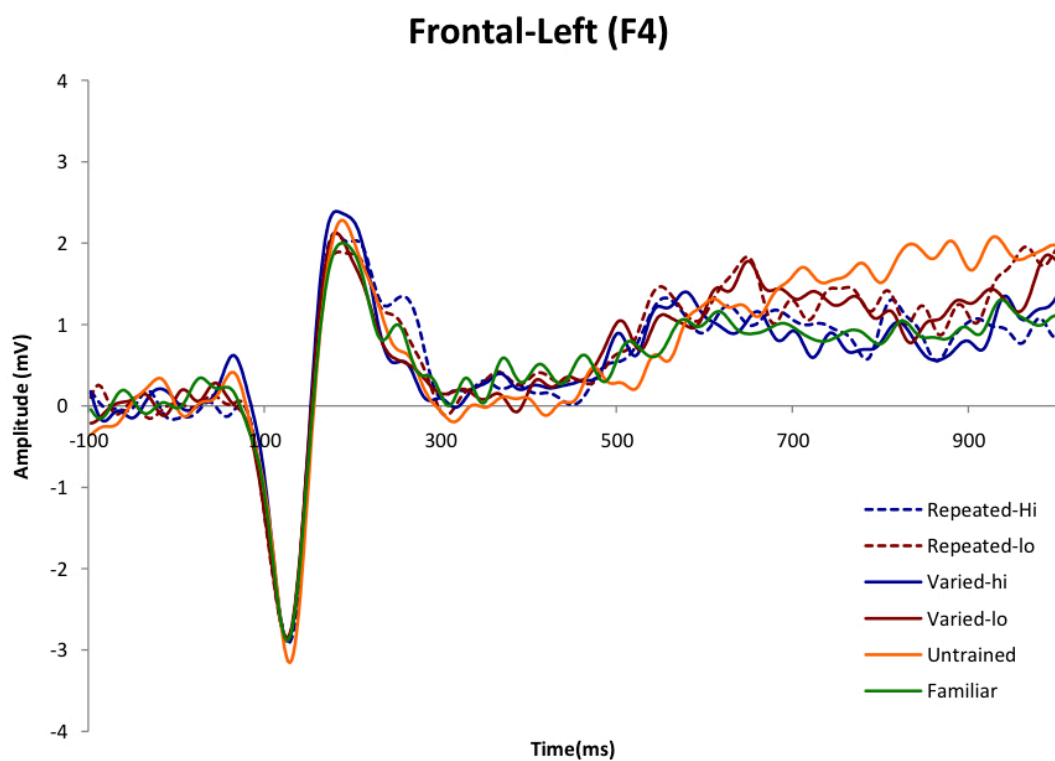
Figure 24. Experiment 2: FN400 effects at frontal-right locations

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5.4.2 Semantic Judgment Task: Word 1: 500 to 700ms

The P600 is hypothesized to index episodic recollection of old versus new items; our a priori hypothesis was that we would observe greater positive amplitudes for words from learning conditions (repeated-hi, repeated-lo, varied-hi, varied-lo) 500 to 700 ms than for words that encountered in learning (untrained and familiar). For this experiment the onset latency of the P600 occurred at approximately 550ms, with the most positive peak occurring at 650ms, therefore, we tested the P600 using a 200ms window from 550ms to 750ms. An omnibus ANOVA of word type (repeated-hi, repeated-lo, varied-hi, varied-lo, familiar, untrained) x lobe (frontal, central, parietal) x hemisphere (left, midline, right) did not indicate any significant differences for word type, $F (5, 12) = 1.16$, $p = .38$, or interactions with word type and lobe, $F (10,7) = 1.34$, $p = 0.36$, and hemisphere, $F (10, 7) = 1.43$, $p = 0.33$. Mean amplitudes for the P600 by word type were as follows: repeated-hi $M = .28$, repeated-lo $M = .068$, varied-hi $M = .033$, varied-lo $M = -.28$, untrained $M = -.083$, and familiar $M = -.207$.

We replicated this analysis with parietal locations to test our a priori predictions that the largest P600 old/new effects would be observed in parietal locations (see Wilding & Rugg et al., 1997). A word type (repeated-hi, repeated-lo, varied-hi, varied-lo, familiar, untrained) x parietal lobe (P3, Pz, P4) did not indicate a significant main effect for word type, $F (5, 12) = .96$, $p = .48$ or a word type x lobe interaction, $F (10, 7) = .57$, $p = .80$. Mean amplitudes for the P600 by word type were as follows: repeated-hi $M = -.55$, repeated-lo $M = -.97$, varied-hi $M = -.70$, varied-lo $M = -1.61$, untrained $M = -1.24$, and familiar $M = -1.29$. To examine for any possible trends in magnitude for these word types, the mean amplitude of untrained words was subtracted from each of the mean amplitudes for the learned conditions and familiar words. Table 13 shows the differences in P600 magnitude for each of the word types.

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Table 13. Experiment 2: P600 magnitude by word type

p = .48	
Word Type	**P600 Magnitude**
Repeated-hi	0.69
Repeated-lo	0.27
Varied-hi	0.54
Varied-lo	-0.38
Familiar	-0.05

Although these results are not statistically significant, they do suggest a P600 trend for 'old' learned words. Most positive amplitudes were observed for repeated-hi and varied-hi words, whereas most negative amplitudes were observed for untrained and familiar words. These data also suggest that semantic constraint may be a facilitating factor in P600 amplitudes because more positive amplitudes were observed for high constraint contexts regardless of their repeated or varied content. Figures 25, 26, and 27 show the ERP waveforms for the P600 at the three parietal hemisphere locations along with bar graphs showing the amplitude of each word type from 500 to 700ms.
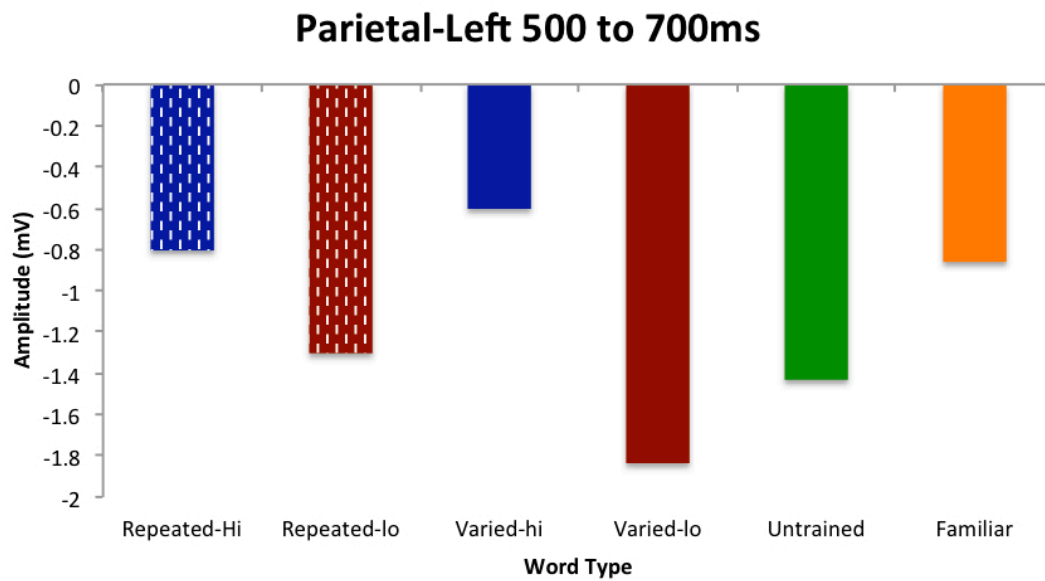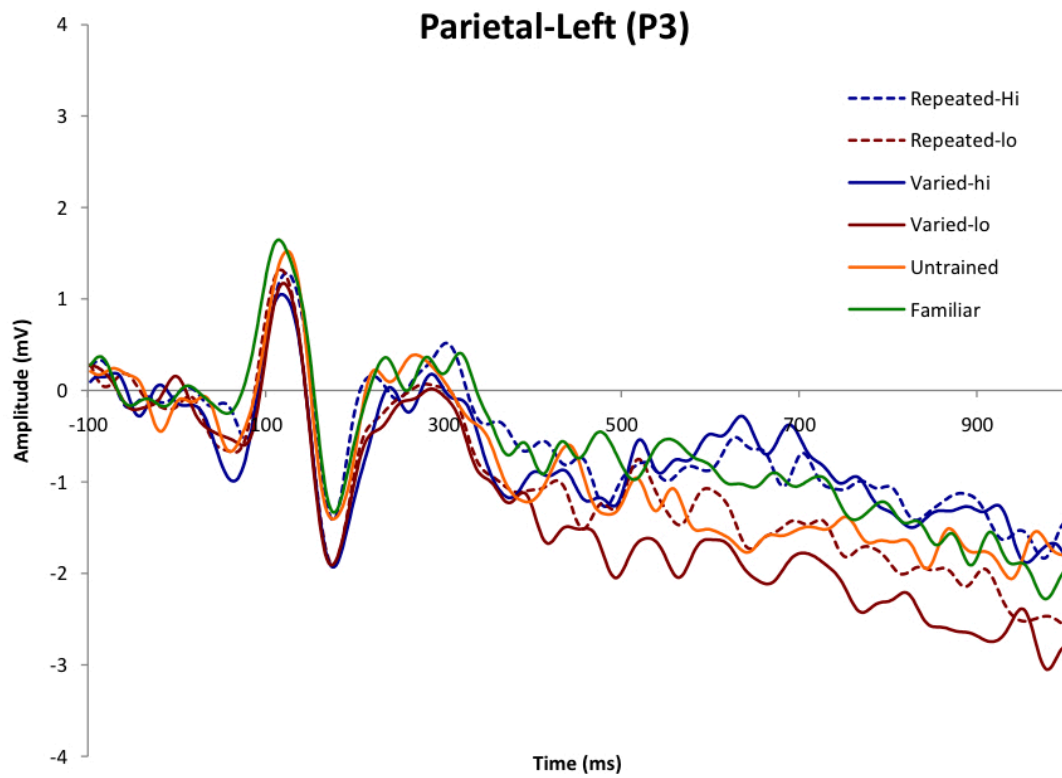
Figure 25. Experiment 2: P600 effects at parietal-left locations
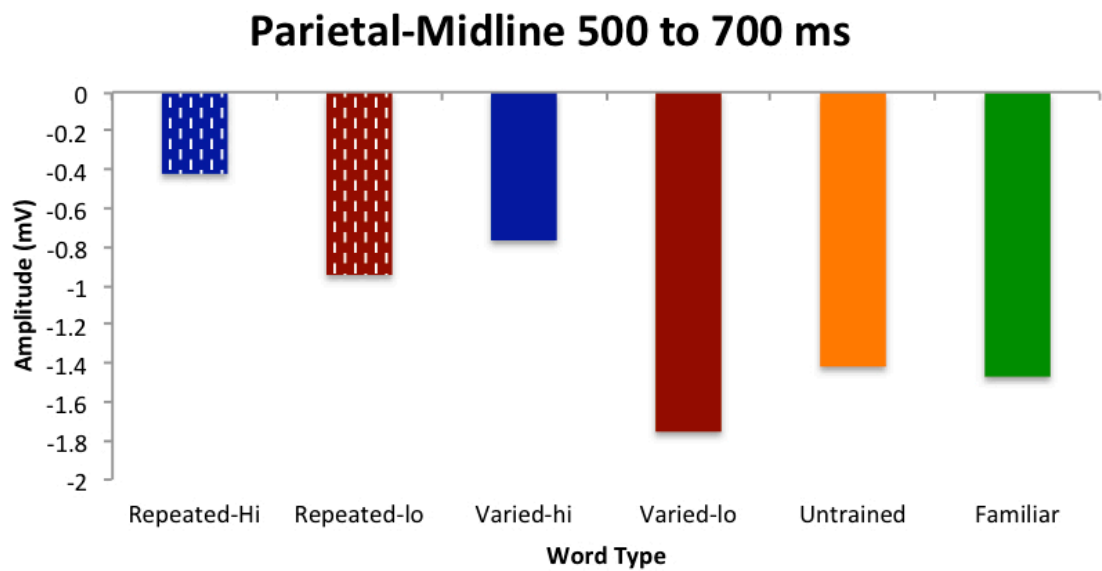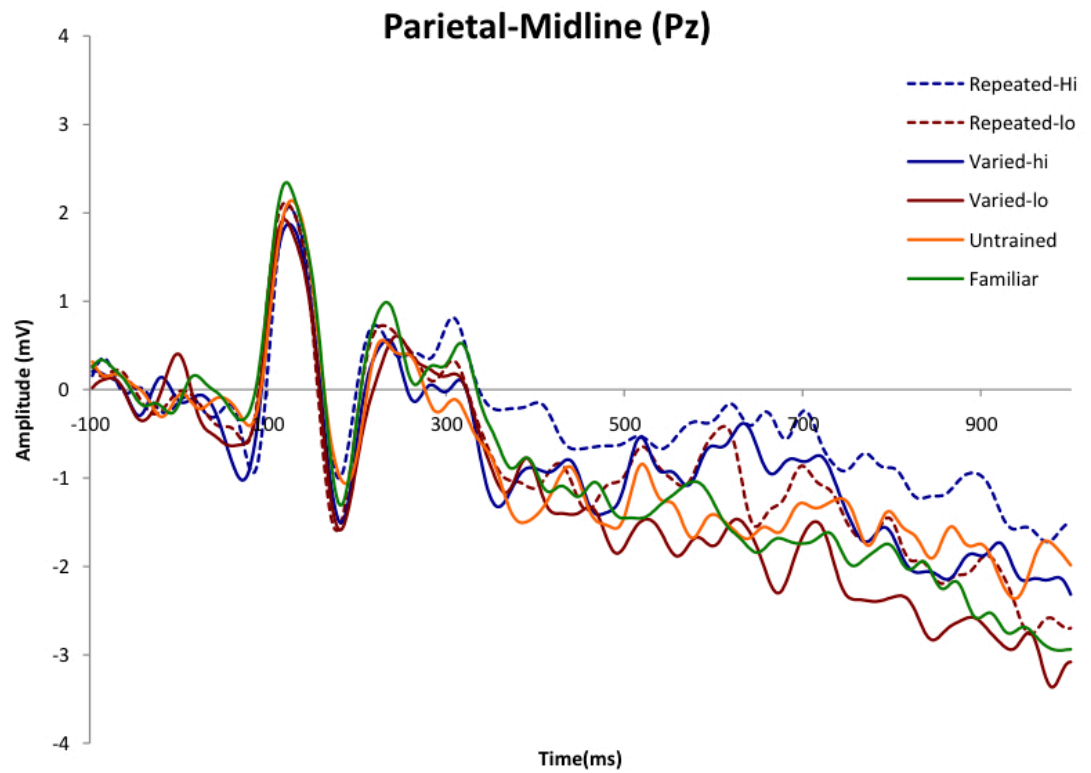
Figure 26. Experiment 2: P600 effects at parietal-midline locations

Parietal-Right (P4)

Time(ms)

Parietal-Right 500 to 700ms

Word Type

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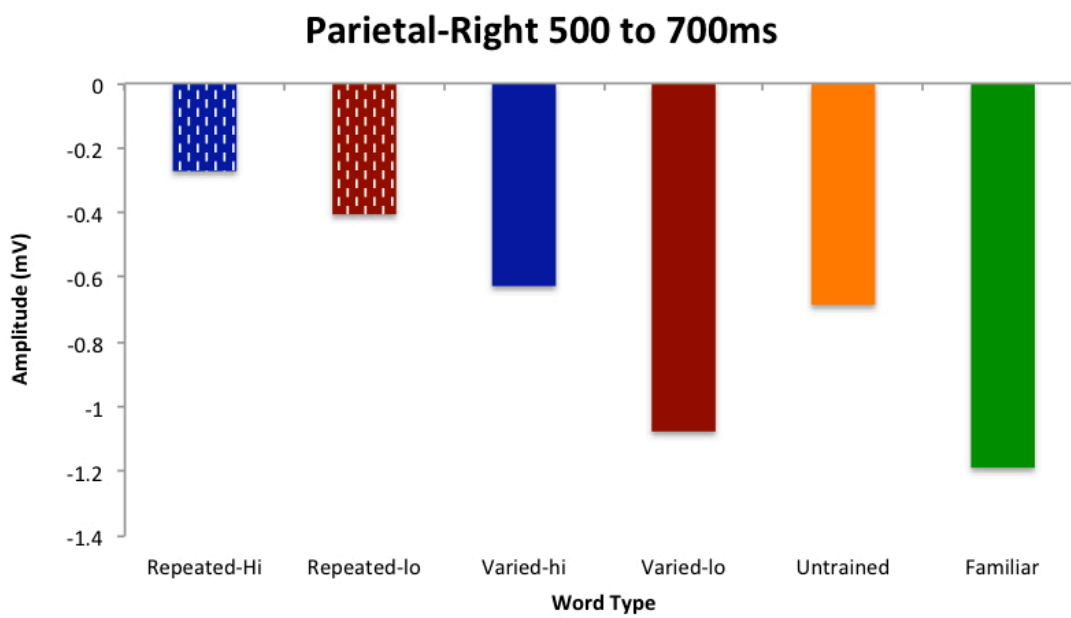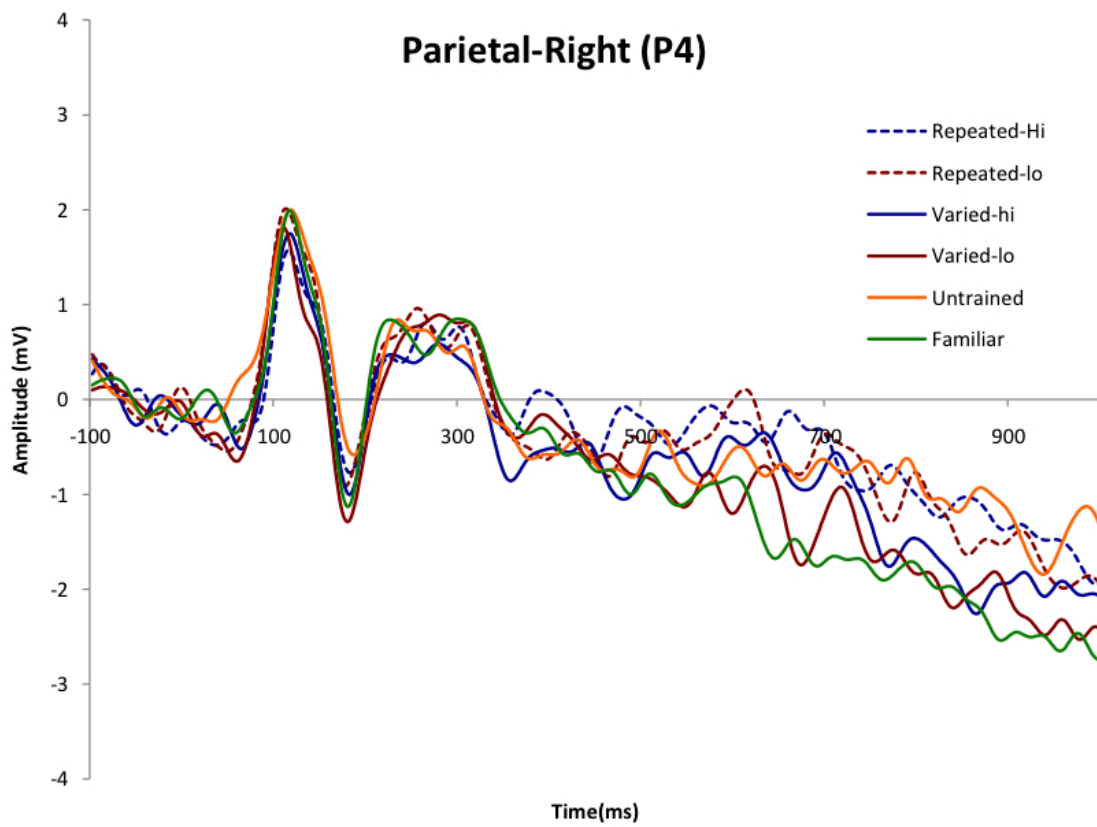
Figure 27. Experiment 2: P600 effects at parietal-right locations

5.4.3   Semantic Judgment Task: Word 2 300 to 500ms

The N400 is hypothesized to index meaning relatedness between a word and its previous context; we tested the hypothesis that reduced N400 amplitudes would be observed for word learning conditions in which the learners acquired the meaning of the words. We predicted that high constraint contexts rather low constraint contexts would produce the largest N400 reductions because they better facilitate the process of encoding a new word's meaning. To the extent that variability facilitates the abstraction of meaning, words learned with varied contexts should also show a substantial reduction of the N400.

An omnibus ANOVA of word type (repeated-hi, repeated-lo, varied-hi, varied-lo, untrained, familiar) x relatedness (related, unrelated) x lobe (frontal, central, parietal) x hemisphere (left, midline, right) indicated a main effect of relatedness, $F (1, 15) = 10.19$, $p < .01$, related word pairs $M = .14$ were more positive than unrelated word pairs $M = -.20$. A word type x relatedness interaction, $F (5,11) = 6.30$, $p < .01$ indicated significant differences between related and unrelated word pairs among the word types. Six pair-wise comparisons ($p < .002$) indicated significant differences between related and unrelated word pairs for familiar words t $(15) = 2.90$, $p < .001$, related pairs $M = .85$ and unrelated pairs $M = -.099$. Marginal effects were observed for repeated-hi words, $t (15) = 1.91$, $p = .08$, related pairs $M = .22$ and unrelated pairs $M = -.40$, and repeated-lo words $t (15) = 2.51$, $p = .02$, related pairs $M = .06$ and unrelated pairs $M = -.33$. No significant differences were found for varied-hi words, $t (15) = -.088$, $p = .93$, (related $M = .068$, unrelated $M = .086$), varied-lo words, $t (15) = -.76$, $p = .46$, (related $M = -.14$, unrelated $M = .049$), and untrained words $t (15) = .99$, $p = .34$, (related $M = -.25$ and unrelated M

= -.51). Figure 28 illustrates these differences between related and unrelated trials for all word

types, indicating a reduction of the N400 for related pairs was only observed for familiar words.
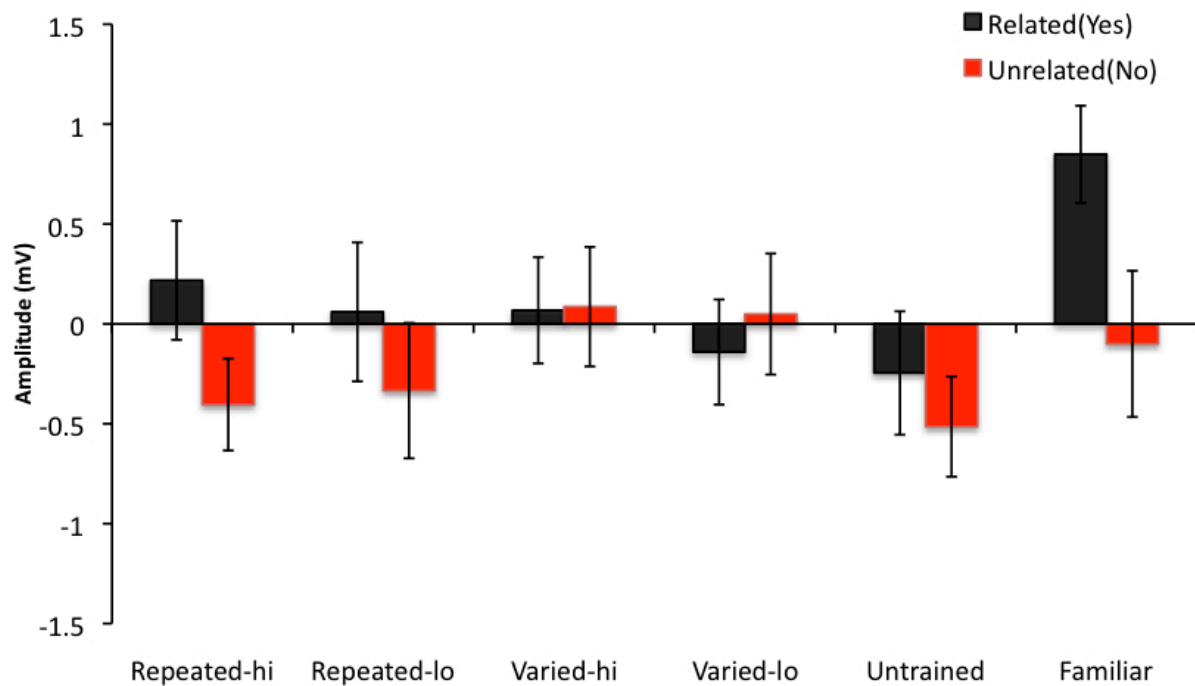
Figure 28. Experiment 2: N400 effects for word type and relatedness

A relatedness x hemisphere interaction $F_{(2, 14)} = 9.16$, $p < .01$ indicated differences in

relatedness for each hemisphere location. Pair-wise comparison ($p < .017$) showed significant

differences for related pairs $M = .53$ and unrelated pairs $M = .012$, at right hemisphere locations,

$t_{(15)} = 2.91$ $p < .01$. Differences at left locations, $t_{(15)} = -.50$, $p = .63$, (related pairs $M = -.38$

and unrelated pairs $M = -.34$), and at midline locations $t_{(15)} = 1.76$, $p = .098$, (related pairs $M =$

.28 and unrelated pairs $M = -.28$), were not significant. N400 effect magnitudes (related pairs -

unrelated pairs) were as follows: left $M = -.044$, midline $M = .56$, and right $M = .52$.

The three-way interaction of word type x relatedness x hemisphere, $F_{(10, 6)} = 4.91$, $p <$

.05 indicated differences in mean amplitudes between related and unrelated trials for left (F3, C3,

P3), midline (Fz, Cz, Pz), and right electrode locations (F4, C4, P4) for all trial types. To examine word type and relatedness effect across hemisphere locations, six ANOVAs, one for each word type were completed. Relatedness x hemisphere ANOVAs did not indicate any main effects for relatedness or relatedness by hemisphere interaction for repeated-hi, varied-hi, and varied-lo words. A main effect of relatedness, $F(1, 15) = 6.3$, $p < .05$ was observed for repeated-lo words, related $M =- .06$ and unrelated $M = -.33$. A significant interaction of hemisphere x relatedness was observed for untrained words, $F(2,14) = 5.19$, $p < .05$. A significant main of effect of relatedness $F(1, 15) = 8.43$, $p < .01$, and a significant relatedness x hemisphere interaction, $F(2,14) = 5.11$ $p < .05$ for familiar words. Related familiar word pairs ($M = .85$) were more positive than unrelated word pairs ($M = -.10$).

Table 14 shows the magnitude of the N400 effect for all word types by hemisphere location. The magnitude of the N400 was computed by subtracting the mean amplitude of unrelated trials from the mean amplitude of related trials. Pair-wise comparisons ($p < .017$)

Table 14. Experiment 2: N400 magnitude by word type and hemisphere

	N400 Magnitude			
	Left	Midline	Right	p-value
Repeated-hi	0.53	0.80	0.54	$p = .13$
Repeated-lo	0.07	0.72	0.40	$p = .36$
Varied-hi	0.11	0.06	-0.22	$p = .51$
Varied-lo	-0.73	-0.13	0.29	$p = .07$
Untrained	-0.50	0.52	**0.79***	$p < .05$
Familiar	0.26	**1.28****	**1.31****	$p < .05$

* significant at the $p < .05$
**significant at the $p < .01$

indicated an effect of relatedness at right hemisphere location for untrained words, $t(15) = 2.23$, $p < .05$, related trials ($M = .16$) and unrelated trials ($M = -.63$). For familiar words, significant relatedness effects were found at midline locations, $t(15) = 2.86$, $p < .01$, related trials ($M = 1.11$)

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and unrelated trials (*M*= -.17), and at right locations t (15) = 3.3, *p* < .01, related trials (*M*= 1.28) and unrelated trials (*M*= -.03). These results replicate our other findings from Experiment 1 showing that the N400 relatedness effect for familiar words is lateralized at midline and right locations.

These data also show a relatedness effect for untrained words at right hemisphere locations. This effect may not be interpretable because the behavioral data did not indicate learners' performance on this task to be better than chance. Furthermore, there is a reversal of this magnitude effect at other electrode locations. Table 15 shows a computation of the N400 magnitude for all electrode cluster sites. The direction of the effect is inconsistent across cluster

Table 15. Experiment 2: N400 magnitude for untrained words by lobe and hemisphere

	N400 Magnitude for Untrained Words		
	Left	Midline	Right
Frontal	-0.94	-0.38	0.43
Central	-0.50	0.80	1.01
Parietal	-0.05	1.13	0.92

locations; the effect is negative at left locations indicating a reduced N400 for unrelated trials rather than related trials. The size of the magnitude is also inconsistent across all cluster locations; large amplitudes are observed in frontal locations where N400 semantic effects are usually unreliable. This inconsistent pattern of effects in the direction and size of the N400 suggests that perhaps these results are not interpretable. Figure 29 illustrates the waveforms for the N400 relatedness by word type effects at central-midline locations.
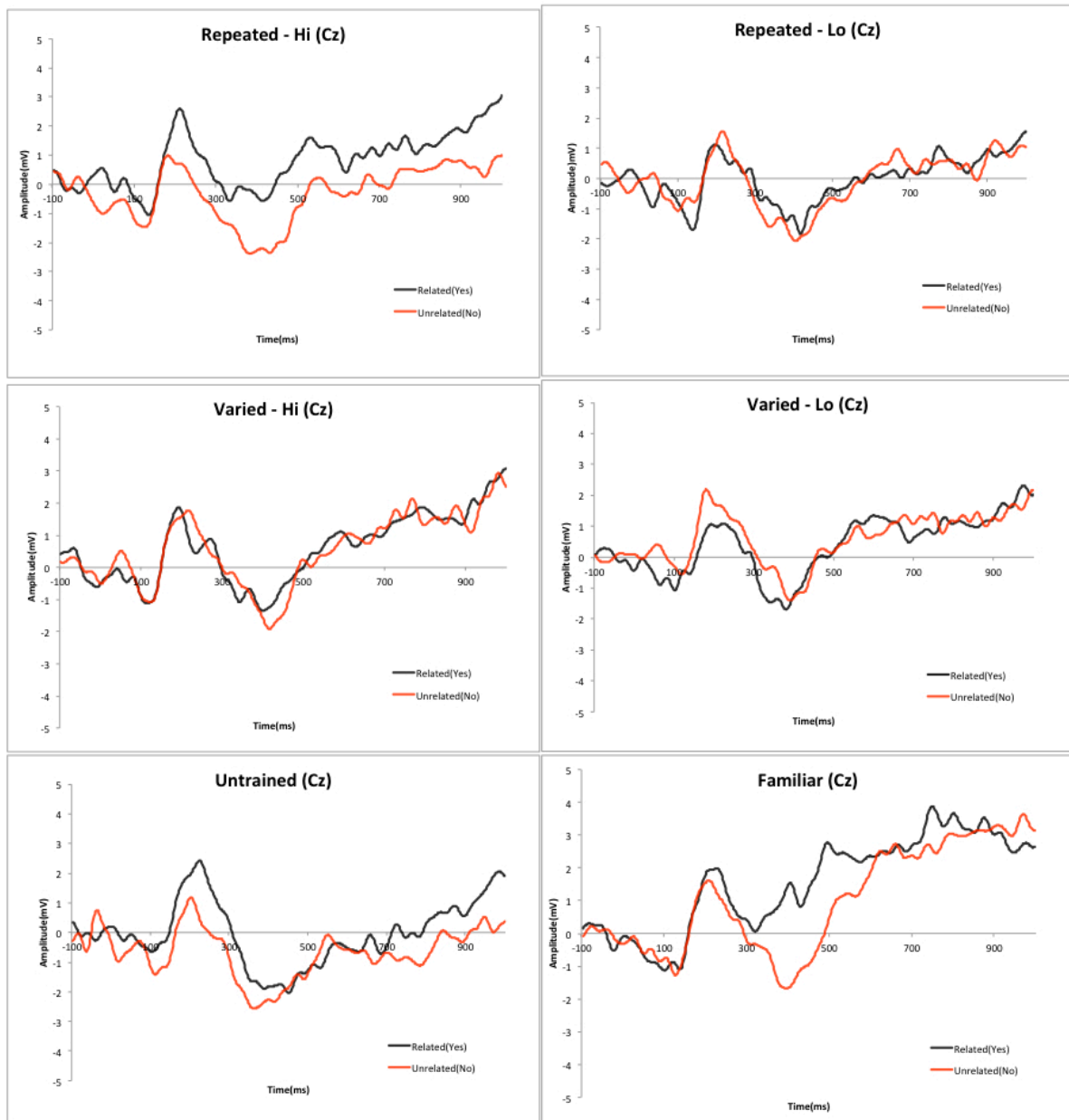
Figure 29. Experiment 2: N400 semantic judgment effects at central-midline electrode

5.4.4   Sentence Judgment Task

As in Experiment 1, we hypothesized that we would observe an N400 effect for contexts in which the final word is incongruent with the content of the sentence, and a reduction of this

effect in contexts in which the final word is congruent. Our prediction was such that high constraint varied contexts allow for better encoding of a words' meaning than the other learning conditions (repeated-hi, repeated-lo, varied-lo), therefore, the largest reductions of the N400 would be observed for this condition. Visual inspection of the data indicated a disparity in latency to peak for the N400 among all word types at all electrode locations of interest. The latency to peak of the N400 for learning conditions occurred approximately at 500 ms and lasted 200 ms, whereas for untrained words, this occurred earlier, at 400ms. To adjust for this disparity, as in Experiment 1, a moving time window was used; mean amplitudes were averaged from 400 to 600ms for the learning conditions, and mean amplitudes were averaged from 300 to 500ms were for untrained words.

A word type (repeated-hi, repeated-lo, varied-hi, varied-lo, untrained) x congruency (congruent, incongruent) x lobe (frontal, central, parietal) x hemisphere (left, midline, right) ANOVA indicated a marginal effect of congruency, $F(1, 14) = 4.05$, $p = .06$; congruent trials ($M = 1.46$) were more positive than incongruent trials ($M = 1.22$). A marginal effect for word type and congruency, $F(4,11) = 2.74$, $p = .08$, indicated more positive amplitudes for congruent than for incongruent sentences for the varied-hi (congruent $M = 1.73$, incongruent $M = 1.15$) and varied-lo (congruent $M = 1.95$, incongruent $M = 1.12$) conditions. Modest differences of congruency were observed for repeated-hi (congruent $M = 1.48$, incongruent $M = 1.46$), repeated-lo (congruent $M = 1.54$, incongruent $M = 1.64$), and untrained (congruent $M = .59$, incongruent $M = .74$).

Marginal effects were also found for the congruency by lobe interaction, $F(2, 13) = 3.21$, $p = .07$, and the congruency by hemisphere interaction, $F(2,13) = 3.25$, $p = .07$. For each interaction, the N400 effect was computed by subtracting the mean amplitude of incongruent

trials from the mean amplitude of the congruent trials. For the interaction with lobe, the largest

N400 effect was observed for the central lobe $M = .43$, frontal lobe $M = .10$ and parietal lobe $M = .18$. For the interaction with hemisphere, the largest N400 effect was observed at midline $M = .34$ and right $M = .37$ hemispheres, left hemisphere $M = .02$.

These trends do correspond with our a priori hypothesis that the N400 effects for this task

would be observed in midline-central electrode locations. To test our a priori hypothesis more

directly, two ANOVAs of word type x congruency were completed for central-midline location

(Cz cluster) and for central-right location (C4 cluster), as these were the locations where the

largest N400 effects were observed. Both electrode locations indicated a significant main effect

of congruency; for the Cz cluster, $F (1,14) = 5.63$, $p < .05$, congruent $M = 2.07$, incongruent $M= .727$, for the C4 cluster, $F (1, 14) = 7.65$, $p < .05$, congruent $M = 2.27$, incongruent $M = 1.81$. A

significant word type x congruency interactions was found for the Cz cluster, $F (4,11) = 4.09$, $p < .05$, and marginal significance for the C4 cluster, $F (4, 11) = 3.13$, $p = .06$. Pair-wise

comparisons ($p < .01$) were completed for word type at each electrode location; the results are

summarized in Table 16. The magnitudes of the N400 effects were computed by subtracting

mean amplitudes for incongruent trials from mean amplitudes of congruent trials. At the Cz

Table 16. Experiment 2: N400 magnitude by word type and congruency

| | Cz Cluster | | C4 Cluster | |
	N400 Magnitude	p-value	N400 Magnitude	p-value
Repeated-hi	0.72	$p= 0.3$	0.84	$p= 0.04$
Repeated-lo	-0.33	$p=0.42$	-0.25	$p= 0.53$
Varied-hi	1.34	$p=0.03$	0.72	$p= 0.18$
Varied-lo	1.60	$p=0.03$	1.21	$p= 0.03$
Untrained	-0.03	$p=0.97$	-0.20	$p= 0.67$

cluster location, the largest N400 effects were observed for varied-hi and varied-lo conditions,

and this same trend was also observed at the C4 cluster location. Repeated-lo words showed a

reversal of the N400 effect; more positive amplitudes for incongruent trials than congruent trials, and this trend was also observed at both cluster locations. The N400 magnitude for untrained words was very small as expected because learners did not have any meaning knowledge of these words. These data do not suggest a lateralization of the N400 effect for word type across central-midline and central-right locations. Figure 30 illustrates the effects of N400 congruency by word type for the central-midline location.

Figure 30. Experiment 2: N400 congruency effect at central-midline electrode

5.4.5   Individual Differences

To examine individual differences in the magnitudes of our FN400, P600, and N400 effects, we performed correlational analyses with each ERP effect and the individual differences measures from the lexical and comprehension battery.

5.4.5.1 FN400 Magnitude

Individual differences measures and the d-prime measures from the semantic judgment task were used in a correlational analysis with FN400 magnitudes (i.e., mean of untrained words subtracted from each mean of the other word types). FN400 magnitudes were used from each of the frontal hemispheres (F3, Fz, F4). A significant correlation, $r = .49$, $p < .05$ of the Raven's test and repeated-lo words at midline locations indicated that non-verbal intelligence was related to greater repeated-lo magnitudes. No other significant correlations or trends were observed for individual differences measures and FN400 magnitudes at left or right frontal lobe locations.

5.4.5.2 P600 Magnitude

Individual differences measures and the d-prime measures from the semantic judgment task were used in a correlational analysis with P600 magnitudes (i.e., mean of untrained words subtracted from each mean of the other word types). P600 magnitudes were used from each of the parietal hemispheres (P3, Pz, P4). Significant correlations with repeated-lo magnitudes were observed for comprehension skill ($r = .51$, $p < .05$), vocabulary skill ($r = .61$, $p < .01$), and phonological awareness measured by the PHaT ($r = .52$, $p < .05$).   These correlations indicate that comprehension, vocabulary, and phonological skills are related to an increased P600 magnitude for single-repeated contexts of low semantic constraint. No other significant correlations or

trends were observed for individual differences measures and P600 magnitudes at left or right parietal lobe locations.

5.4.5.3 Semantic Judgment N400 Relatedness Magnitude

Our ANOVA analyses indicated that the greatest N400 magnitudes (related-unrelated) were observed at midline and right electrode locations, therefore, correlational analysis with individual difference measures were performed with the magnitude of each word type at midline and right locations. A marginally significant correlation of spelling and familiar word magnitude at midline hemisphere locations, $r = .43$, $p = .09$, and a significant correlation of real word test and familiar word magnitude, $r = .62$, $p < .01$ showed that phonological decoding and orthographic knowledge were related to the size of the N400 magnitude for familiar words. Better scores on these tests were related to greater N400 magnitudes. No other significant correlations were found.

5.4.5.4 Sentence Judgment N400 Congruency Magnitude

Our ANOVA analyses indicated an effect of congruency at central-midline locations (Cz). We correlated the N400 congruency effect (congruent-incongruent) for each word type with all of the individual differences measures. Significant correlations of comprehension skill ($r = .55$, $p < .05$), vocabulary skill ($r = .64$, $p < .01$), spelling ($r = .69$, $p < .01$), and phonological awareness measured by the PHaT ($r = .77$, $p < .01$) and varied-lo magnitude were found. These correlations indicated a bigger N400 magnitude with better scores of comprehension, vocabulary, spelling, and phonological awareness, indicating that these skills are related to making meaning decisions for low constraint contexts.

5.5   RESULTS SUMMARY AND CONCLUSIONS (5.5)

5.5.1   Behavioral Data

Performance on the semantic and sentence judgment tasks showed an advantage of semantic constraint and variability across the two tasks. Slower decision times and more accurate responses, which were collapsed across relatedness or congruency effects, were observed for words learned with high constraint sentences in the semantic and sentence judgment tasks. When overall accuracy performance for learned and untrained trials was compared, learners performed more accurately for all learned conditions, whereas, performance for untrained words was at chance. These behavioral data suggest that for new single-word and single-sentence contexts, learners make more accurate, but not faster, meaning decisions.

However, learners did show an effect of variability for the semantic judgment task when relatedness was a factor. Significant differences in relatedness were observed for varied-hi and varied-lo conditions, but not for the repeated-hi or repeated-lo conditions. Variability was not a factor in making more accurate congruency decisions in the sentence decision task, a marginal effect for repeated-hi words was observed.

The effects found for variability and relatedness in the semantic judgment task contradicted our predictions. We hypothesized that in a single-repeated high constraint sentence, learners would be able to encode the meaning of the word, and it would be strengthened across multiple encounters, thus producing a stronger representation of the word's meaning for a single-word meaning decision. However, in varied low constraint sentences, the meaning of the word is not supported in the context, nor is it strengthened across multiple encounters, thus, producing a weaker representation. We expected that variability would be critical for making contextual

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decisions in the sentence judgment task; however, our results suggest that the availability of meaning from a single-repeated high constraint sentence is better for making contextual decisions. Thus, based on these data, we cannot conclude as we did in Experiment 1 that more contextual instances yield better performance for contextual decisions.

As a measure of decontextualized meaning knowledge, the definition generation task indicated that learners generate more accurate definitions for words learned with high constraint than with low constraint sentences. These data also indicate that varied learning conditions were better than repeated learning conditions. Results from this task replicate our previous findings from Experiment 1 that learners generated more accurate definitions in varied conditions rather then in repeated conditions.

5.5.2 ERP Data

Table 17 summarizes the significant ERP effects and trends for all word types across tasks. As illustrated in Experiment 1, the meaning acquisition effects for the semantic judgment task are referred to as N400-related, and for the sentence judgment task, N400-congruent. The effects for the FN400, N400-related, and N400-congruent refer to the reduction of the N400 negative amplitude from 300 to 500ms either for familiarity or meaning congruence. The P600 effect refers to greater positivity from 500 to 700ms. Boxes that are marked with a '+' indicate a significant effect, boxes that are marked with a '-' indicate a trend, boxes that are blank indicate neither.

Table 17. Experiment 2: ERP effects summary

ERP Effects for Experiment 2				
	FN400	P600	N400-relate	N400-congruent
Repeated-hi	-	-	-	+
Repeated-lo	-			
Varied-hi		-		+
Varied-lo				+
Untrained			+	
Familiar			+	

Our first hypothesis for this experiment was that the degree of semantic constraint in which a word has been encountered would result in episodic traces that differ in strength, and that these differences would affect familiarity and recognition. Our data did not support a significant effect of familiarity, however, marginal effects of the FN400 indicated that familiarity was modulated by variability rather than by semantic constraint. Reduced FN400s were observed for repeated-hi and repeated-lo words, suggesting that episodic traces that are strengthened by repetition rather than by availability of meaning modulated familiarity for this experiment. As observed by the trends of the data, there was small difference between the FN400 magnitude for repeated-hi words (.87) and repeated-lo words (.78), thus further reinforcing the idea that familiarity was modulated by episodic memory strength. These results do not replicate our findings from Experiment 1 that indicated that familiarity was modulated by the availability of meaning (i.e., repeated D and varied C conditions). These differences in familiarity effects across the two experiments may be due to a learning strategy adopted by the learners during learning in the absence or presence of dictionary definitions. In Experiment 1, the availability of explicit information about the word's meaning from dictionary definitions may have shifted the learners' attention to conditions in which they could derive the word's meaning as a way to remember the words. In Experiment 2, the absence of explicit meaning information

may have shifted the learners' attention to learning conditions in which the words were repeated as a way to remember the words.

However, the trend observed for the P600 old/new effect suggests that differences between the magnitudes for 'old' words are affected by the availability of meaning. Among the learning conditions, most positive amplitudes from 500 to 700ms were observed for repeated-hi and varied-hi words; for these conditions, the single-sentence contexts were supportive of the word's meaning, whereas varied-lo and repeated-lo conditions were to a lesser extent. Across all word types, varied-lo words showed the most negative amplitudes, suggesting that the absence of meaning information in combination with a larger sum of diffuse contextual memory traces does not facilitate the recollection of a recently learned word. A similar trend was observed in Experiment 1 for repeated-D, varied-D, and varied-C conditions; learning conditions which are supportive of the word's meaning. Data from across these two experiments suggests that the 'depth of encoding' of a word's meaning from a recent learning episode may modulate the recollection of 'old' items (i.e., Mestre-Misse et al., 2007).

Our second hypothesis for this experiment was that semantic constraint and variability will result in differences in meaning acquisition. Specifically, we predicted that varied contexts of high semantic constraint would result in better learning of a word's meaning than single-repeated contexts and varied contexts of low semantic constraint. Meaning acquisition was measured in two ways; in a new-single word and in new sentence contexts that differed from those that were encountered during learning. In a single-word context, we observed a trend for repeated-hi words with a reduction of the N400 for related words. This suggests that in the repeated-hi conditions, learners were able to acquire some aspects of the word's meaning to make the relatedness judgment. As predicted, a significant robust reduction of the N400 was

observed for related trials in the familiar words. However, our data does not support our prediction that varied-hi words would lead to better meaning decisions in single-word contexts. No reduction of the N400 was observed at any hemisphere or lobe locations for this condition. Across all four learning trials for the varied-hi conditions, the meaning of the word was supported with different content. Learners may have had difficulty encoding a unified meaning representation of the word from this varied content. The absence of such a representation would hinder a learner's ability to make a relatedness judgment in a single- word context. Repeated-hi words have an advantage for the semantic-judgment task because a single encoded word is abstracted and strengthened with each encounter, thus yielding a more unified meaning representation of the word. As expected words learned with repeated-lo and varied-lo conditions did not show significant reductions of the N400 for related trials; neither condition supports the abstraction of word meaning from context.

Results from the sentence judgment task support our prediction about contextual variability facilitating more accurate contextual decisions. Our data indicated a reduction of the N400 for congruent trials for the varied-hi and varied-lo conditions, which was lateralized at central-midline locations. A smaller, but a signification reduction of the N400 was also observed for repeated-hi congruent trials. These results indicated the availability of meaning knowledge and the availability of word-use knowledge are important for making contextual decisions. For the varied conditions, varied-lo words generated a larger N400 magnitude (1.60), but not significantly different than for the N400 magnitude for varied-hi words (1.34). This suggests that learners may benefit from variability of content in the absence of definitional meaning information to make accurate contextual decisions. In the case where meaning information is available (i.e., repeated-hi and varied-hi), this contextual information may not be as critical.

5.5.3 Individual Differences

Correlations with behavioral and ERP data indicated that orthographic, phonological, and semantic knowledge is correlated with learning new word meaning from context, and that these skills are especially critical for learning encounters where the context sentence is not supportive of the word's meaning (i.e., varied-lo condition). Vocabulary scores and scores from the spelling, real word, and PHaT tests correlated with bigger N400 congruency magnitudes for the varied-lo condition. We also observed that the Raven's measure of non-verbal intelligence was positively related to bigger N400 magnitudes for low constraint contexts. This correlation may indicate that learners with better non-verbal intelligence may employ different strategies to learn meaning from a low constraint context. These correlations suggest that lexical skills, and perhaps non-verbal intelligence, are especially critical for learning new meaning in vague contexts. These results correspond to other findings (e.g., Ouellette, 2006; Cain, Oakhill, Lemmon, 2004) that illustrate that high-skill readers with better lexical and comprehension skills are more successful at learning new word meaning from context.

6.0   GENERAL DISCUSSION AND IMPLICATIONS

The goal of the present experiments was to examine the effects of word experience on three processes related to vocabulary learning: meaning acquisition, familiarity, and recollection. In two experiments, we presented learners with previously unknown words and manipulated the contextual properties in which they were presented. We measured how the type of context, variability, and semantic constraint affected meaning acquisition and subsequent processing of these words. In the following discussion, we first review our theoretical framework and hypotheses, and then discuss how each of these contextual properties affected familiarity, recollection, and meaning acquisition.

6.1   INSTANCE-BASED LEARNING APPROACH

Our word experience framework makes a general assumption that each experience with a word is encoded in specific episodic traces in memory that preserve all the properties that comprise that experience. According to this model, repeated properties of word experiences will be represented in multiple episodic traces, and these traces may vary in quality and quantity as a function of the contexts in which a word has been encountered, and further, affecting how the word will be processed in a new context. For our contextual properties of interest, the instance-based model makes the following predictions:

(1) The type of context (definitions or single-sentence contexts) in which a word is encountered would result in episodic traces of differing strength and distribution. If definitions are encoded in a broader and weaker distribution of episodic traces than sentences, we should observe differences in familiarity and recollection when the word is encountered in a new context.

(2) The variability of a contextual episode (varied or repeated) will result in episodic traces of differing strength and quantity. The cumulative strength versus the sum of all episodic traces may have differential effects on familiarity and meaning acquisition. Varied contexts allow for the abstraction of meaning to occur, whereas repeated contexts strengthen episodic traces.

(3) The semantic constraint of a sentence in which a word is encountered affects the encoding of the word's meaning. High constraint sentences facilitate meaning acquisition better than low constraint sentences, thus affecting meaning acquisition and subsequent encounters with the word in new contexts.

6.2   VOCABULARY LEARNING OUTCOMES

For the present experiments, we examined the effects of word experience on three word learning related learning outcomes: familiarity, recollection, and meaning acquisition. Our tasks were designed to measure familiarity and recollection, and two types of meaning representations: word-level semantic knowledge and contextual knowledge. Our ERP measures served as indicators for each of these processes: FN400 for familiarity, P600 for recollection, N400 relatedness effect for word-level semantic knowledge, and N400 congruency effect for

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contextual knowledge. Table 18 integrates the results observed across both experiments for the effects of type, variability, and semantic constraint on each of these learning outcomes. As in previous tables, a '+' indicates a statistically significant effect, and '-' indicates a marginal trend.

Table 18. Summary of Experimental Findings

Learning Outcome	Type/Quality		Variability	
			Repeated	Varied
Familiarity	Type	Definition	+	
		Context		+
	Constraint	High	-	
		Low	-	
Recollection	Type	Definition	-	-
		Context		-
	Constraint	High	-	-
		Low		
Word-level semantic knowledge	Type	Definition		
		Context		-
	Constraint	High	-	
		Low		
Contextual Knowledge	Type	Definition	-	-
		Context		-
	Constraint	High	+	+
		Low		+

6.2.1 Familiarity

Our results indicated that familiarity may not be modulated by type or variability. Words that were learned with varied C and repeated D conditions showed a significant reduction of the FN400 effect. Finnigan et al., (2002) reported that familiarity as indexed by the FN400 is modulated by memory strength via repetition. This would support our finding for the repeated D word because they were strengthened over four learning trials. However, this does not explain the reduced N400 effect found for varied C words. Episodic traces that were encoded in this condition were not strengthened across multiple episodes, but still produced a familiarity effect. Thus, our findings do not necessarily support the view that memory strength alone modulates familiarity. These results also do not favor the view that a greater sum of encoded traces modulates familiarity; we observed a marginal trend that indicated reduced FN400 effects for repeated-hi and repeated-lo words.

The results for the repeated D and varied C conditions favor Gernsbachers' (1984) view that familiarity is a process related orthographic and meaning information. For both of these conditions, meaning was either strengthened in four learning episodes, or abstracted over four learning episodes. The trend observed for the repeated-hi condition corresponds with this view. High constraint sentences allow for a deeper encoding of a word's meaning, and it is strengthened over the course of four learning episodes. However, such an effect would also be expected for varied-hi words, but this was not indicated in our data. Therefore, our data suggest that familiarity can be modulated by both the availability of meaning information and memory strength as a product of repetition.

These data also suggest that learners may have adopted differential strategies in the two different learning sessions; in one session, definitions were present, whereas in the other, only

sentence contexts were present. Chaffin et al., 2001 suggested that learner's engage in an attentional shift to infer an unknown word's meaning given the context in which it is encountered. Further, Balass, Bolger, and Perfetti (2006) found that learners adopt different learning strategies when definitions are present during learning. Perhaps for these experimental manipulations, in learning sessions where definitions were present, learners did not have to engage in any cognitive effort to learn the meaning, thus, simple repetition of repeated D words modulated the FN400, and the increased cognitive effort for context conditions may have modulated the familiarity for the varied C condition. For learning sessions where definitions were absent, learners may not have shifted attention to any given condition, thus, simple repetition in the single-repeated trials modulated familiarity.

6.2.2 Recollection

Our findings did not indicate a reliable effect for 'old' words versus 'new' words. For word learning paradigms, Perfetti et al. (2005) reported robust P600 episodic effects that differentiated old words encountered during learning from new words that were encountered during testing. Similar P600 episodic effects have been reported in other word learning studies (e.g., Balass et al., 2010; Borovsky et al., 2010, Mestres-Misse et al., 2007; Key et al., 2006). The present experiment failed to replicate these recollection effects for old and new words. However, in these studies that are mentioned, learners were exposed to a smaller set of words. For example, Perfetti et al. exposed their learners to 60 words in a pair-associate learning paradigm, whereas Balass et al., did trained their learners with 120 words, but they used a 100% learning criterion for all learners. Further, P600 old/new effects illustrated in memory paradigms are based on a small set of words, typically no more than 60 (Rugg, et al., 1999; Curran, 2007; Finnigan et al.,

2002). For the present experiments, no learning criterion was set, and learners were exposed to the words an in incidental learning paradigm, this possibily contributed to the null effects for the P600 effect.

However, our data did indicate marginal trends for 'old' and 'new' words. Repeated D, varied D, and the varied C conditions in Experiment 1 showed an increase in positivity from 500 to 700ms, and repeated-hi and varied-hi conditions in Experiment 2. The repeated C condition and the low constraint conditions did not indicate such a positivity trend. These marginal effects correspond to findings by Nessler et al., (2001) who found that recognition of recently learned words is affected by the depth of encoding. Words that are learned with high constraint conditions rather than low constraint conditions allow for a deeper encoding of the word's meaning, thus, establishing stronger episodic traces for those words. A similar process may also account for the marginal effect for varied C condition that facilitates the abstraction of the word's meaning over multiple episodes.

6.2.3 Word-level semantic knowledge

For the semantic judgment task, learners were required to make meaning relatedness judgments about recently learned words in a new single-word context. We predicted that if learners acquired definitional information of the word, then a reduction of the N400 would be observed for related trials. Interestingly, our data did not indicate a reduction of the N400 for words learned with definitions, but a marginal effect for varied C words. A marginal N400 reduction was also observed for repeated-hi words. Both of these conditions facilitate the abstraction of word meaning, for varied C words, this facilitation occurs over multiple encounters, whereas for repeated-hi words, the abstracted meaning is also strengthened over multiple encounters. These

conditions also present the learners with contextual information in addition to information about the word's core meaning features; this contextual information is absent in dictionary definitions. As previous mentioned, Miller (1999) argues that relational information of a word to other words is critical for meaning processing, and this type of knowledge develops from many encounters of the word in context. Dictionary definitions are typically disconnected units of meaning features that do not necessarily present the learner with relational information (McKeown, 1993). According to our framework, diffuse meaning features are not necessarily encoded in stronger memory traces, thereby establishing a weaker meaning representation of the word, and affecting its processing in new contexts. For this reason, words learned with the varied-hi condition did not show a reduced N400 for related trials. Though high constraint sentences facilitate a deeper encoding of a word's meaning, their effectiveness may be diminished when they are coupled with varied content. When a word in encountered in a varied high constraint context, the learner the learner may abstract a different word with each encounter, thus, establishing a weaker and diffuse definition-like word representation. For single-word contextual decision, such a representation may not support the relational information needed to make an accurate response.

6.2.4   Contextual Knowledge

For the sentence judgment task, learners were required to make meaning relatedness judgments about recently learned words in a new single-sentence context. We predicted that a larger reduction of the N400 would be observed for conditions that facilitated the acquisition of definitional and contextual knowledge. Our data indicated an interesting interaction of semantic constraint and variability. Learners showed significant reductions of the N400 for congruent trials for high constraint contexts, with larger N400 magnitudes for varied-hi words than for

repeated-hi words. Further, our data indicated large N400 magnitudes for varied-lo words, indicating that learners were able to make contextual decisions without the availability of word-level semantic knowledge that would be derived from high constraint sentences. No differences in congruency were observed for repeated-lo words. Similar trends were observed type context and variability. Learners showed larger N400 reductions for congruent trials for definitions and varied contexts, whereas, modest differences for congruency were observed for repeated C words. These results of variability from both experiments suggest that variability is an important factor in learning contextual knowledge, and further, that the type of knowledge (definition or context) may not be important. In Experiment 1, variability of contextual knowledge or word-level semantic knowledge facilitated more accurate responses for congruent and incongruent sentences. In Experiment 2, variability of either high or low semantic constraint facilitated more accurate responses for congruent and incongruent sentences. These results strongly support the idea that variability is important for the acquisition of vocabulary knowledge. Furthermore, variability of contextual knowledge, even in impoverished contexts of low semantic constraint, facilitates accurate semantic congruency decisions, as indicated by our results for the varied-lo condition.

A word experience with a single-repeated context of low (repeated-lo) or medium (repeated C) semantic constraint is an impoverished word learning experience. These learning conditions do not support the acquisition of definitional or contextual knowledge of a word. Our data consistently showed that these conditions did not facilitate any of our measured learning outcomes. According to our framework, words learned with repeated C or repeated-lo contexts do not get encoded in strong episodic traces, and as our data suggests, familiarity and recollection are modulated by the availability of meaning knowledge. These data suggest for

contextual decisions, the availability of either definitional or contextual knowledge may be sufficient for an accurate response, whereas for definitional decisions, both contextual and definitional information is critical.

6.3   INDIVIDUAL DIFFERENCES

Our individual difference measures correlated with behavioral and ERP data suggested that orthographic and phonological skills and vocabulary knowledge are essential for word learning. Learners who had higher scores for orthographic and phonological skills also showed more accurate responses for the learning conditions.   Furthermore, scores on orthographic, phonological, and meaning knowledge assessments were related to larger N400 magnitudes for relatedness and congruency measures.   Daneman and Greene (1986) suggested that these differences in correlations may be do to the fact that learners with poorer lexical and comprehension skills do not have sufficient resources to dedicate to meaning acquisition because they struggle with basic comprehension processes.   In terms of our framework, learners with better comprehension and vocabulary skill may possibly make better use of their experiences with words, thus, encoding word experiences in stronger episodic traces which can account for their superior performance.

Interestingly, significant correlations with individual difference measures of lexical skill (spelling and phonological awareness) were present for Experiment 2, which did not include the presence of definitions in the learning phase. Significant correlations with varied and repeated low constraint conditions indicated that orthographic and phonological awareness, in addition to vocabulary knowledge, were related to accuracy performance and N400 magnitudes for these

conditions. These correlations perhaps suggest that comprehension, vocabulary, and lexical skill are critical for learning experiences where the meaning of the word is not explicit or can be easily encoded. This finding needs to be tested more directly by testing learners of a boarder range of skill.

6.4 IMPLICATIONS FOR VOCABULARY INSTRUCTION

Our results do not support that only one contextual property is better for learning word meaning; the data does support that different experiences contribute different learning outcomes. Results from the present experiments show that variability of content in addition to experiences that support the abstraction of meaning knowledge to be superior for meaning acquisition and familiarity. Further, our results do not support our initial prediction that definitions are poor contexts for word learning. Repeated definitions did facilitate subsequent familiarity and recollection processes of the words in a new context, however, they did not contribute to accurate definitional and contextual decisions. Our data suggest that for explicit vocabulary instruction, a variety of word experiences that support both the acquisition of meaning knowledge and word use are most optimal for increasing word knowledge. However, this may not generalize to all learners, especially those with poor lexical and comprehension skills. The benefits of these learning conditions for learners with poorer lexical and comprehension skill would have to be established in experiments where these skills are directly manipulated.

Table 19. Target words and dictionary definitions

Target Word	POS	Definition 1	Definition 2	Definition 3	Definition 4
assiduous	adj	constant in application or attention; diligent	showing great care and perseverance	showing hard work, care and attention to detail	marked by careful unremitting attention
baleful	adj	portending evil; ominous	threatening harm; full of malice; ominous	foreboding or threatening evil	full of evil intentions; threatening
bawdy	adj	humorously coarse; risqué	ribald in a frank humorous, and crude way	boisterously or humorously indecent	Indecent; raunchy;
caitiff	adj	despicable and cowardly	contemptible or cowardly	evil, mean, or cowardly	despicably mean and cowardly
chary	adj	very cautious; wary	cautiously reluctant to do something	characterized by cautious hesitance and vigilance	careful; wary; cautious
churlish	adj	rude or vulgar in behavior or manner	rude; ungracious; surly	rude, mean-spirited, and surly	rude, unfriendly, and unpleasant
cogent	adj	appealing to the intellect or powers of reasoning; convincing	forceful and to the point, as a reason or argument; convincing	convincing or believable by virtue of a clear presentation	convincing, or compelling by virtue of a strong argument
desultory	adj	moving or jumping from one thing to another; disconnected	aimlessly passing from one thing to another	going from one thing to another erratically and intermittently	jumping or passing from one thing to antoehr, without order
diffident	adj	marked by a lack of self-confidence; shy	hesitant due to lack of self-confidence	unsure and not confident of your abilities	lacking confidence; timid
doughty	adj	marked by stouthearted courage; brave	consistently brave and strong; courageous.	determined, brave and unwilling ever to admit defeat	steadfastly courageous and resolute; valiant.

ebullient	adj	full of cheerful excitement or enthusiasm	lively and enthusiastic	an enthusiastic or energetic manner	overflowing with enthusiasm, high spirits
edacious	adj	characterized by voracity; devouring	frequently consuming a great deal of food or drink	devouring or craving food in great quantities	having an insatiable appetite; voracious
erudite	adj	having or showing great academic knowledge	having or showing a high level of scholarly knowledge	having or showing great profound knowledge	having or showing a wide knowledge
fractious	adj	tending to argue, fight, or complain	irritable and likely to complain or misbehave	inclined to be irritable and quarrelsome; cranky	headstrong, irritable, and stubbornly
indubitable	adj	too apparent to be doubted; unquestionable	obvious or definitely true, and not to be doubted	impossible to doubt; unquestionable	too evident to be doubted; certain
inimical	adj	injurious or harmful in effect; adverse	tending to obstruct or harm; hostile	being adverse often by reason of hostility or malevolence	adverse in tendency or effect; unfavorable
insipid	adj	lacking flavor or zest; not tasty	without taste or flavor	lacking taste or savor	having a bland or uninteresting flavor; tasteless
jejune	adj	lacking interest or liveliness; dull	boring: uninteresting and undemanding	devoid of significance or interest : dull	not interesting or satisfying; dull
laputan	adj	unrealistic: concentrating on absurdly impractical ideas	absurdly impractical or visionary	not practical or realizable; speculative	airy: not practical or realizable
lugubrious	adj	extremely mournful, sad, or gloomy	gloomy, mournful or dismal to an exaggerated degree.	very sad and depressed; mournful	sad or mournful in an exaggerated way; gloomy
mendacious	adj	given to deception; lying	prone to lying at any time	likely to give false information or tell lies	telling lies, habitually; dishonest
mephitic	adj	malodorous or foul-smelling	foul-smelling; noxious	very bad-smelling	offensive to the smell
nugatory	adj	of little or no importance; trifling	trifling; futile; insignificant	of no real value; trifling; worthless	of little or no consequence : inconsequential
obsequious	adj	full of or exhibiting servile compliance; fawning	excessively eager to please or obey	obedient to an excessive or servile degree	marked by or exhibiting a fawning attentiveness
odious	adj	provoking or deserving of hatred; loathsome	inspiring hatred, contempt, or disgust	extremely unpleasant; causing and deserving hate	arousing or deserving hatred or repugnance
peremptory	adj	putting an end to all debate or action	closed to further consideration or action	not open to appeal or challenge;	not admitting of question or appeal
perfunctory	adj	done routinely and with little interest or care	done quickly, without taking care or interest	done in a careless and superficial manner; rote	performed as a routine duty; hasty and superficial

petulant	adj	unreasonably irritable or ill-tempered; peevish	ill-tempered or sulky in a peevish manner	easily irritated or angered, especially in a childish way	childishly sulky or bad-tempered
propitious	adj	presenting favorable circumstances; auspicious	favorable and likely to lead to success	offering favorable circumstances or conditions; promising	boding well; favorable; auspicious
punitive	adj	inflicting or aiming to inflict punishment;	pertaining to, imposed as, or imposing punishment	something that is intended as a punishment	involving, awarding, or inflicting punishment
querulous	adj	given to complaining; peevish.	inclined to complain or find fault	inclined to complain or whine	habitually complaining; fretful
reticent	adj	disposed to be silent or not to speak freely	reserved; unwilling to communicate	inclined to keep silent; reserved;	unwilling or disinclined to talk
sagacious	adj	having or showing keen discernment, sound judgment, and farsightedness	having or showing acute mental discernment and keen practical sense	characterized by good judgment and common sense	having or showing understanding and the ability to make good judgments; wise
sonorous	adj	wordy or grandiloquent in style of speech	speaking in a full, and impressive manner	(of speech) using imposing or grandiose language	high-flown; grandiloquent speech
stolid	adj	having or revealing little emotion or sensibility;	calm and not showing emotion or excitement	neither feeling nor showing much range of emotion; impassive	not easily stirred or moved; unemotional
turbid	adj	obscure or confused in meaning or thought	confused; perplexed; muddled	disturbed; confused; disordered	in a state of confusion; muddled; bewildered
venial	adj	easily excused or forgiven; pardonable	of a kind that can be remitted; forgivable	excusable; trifling; minor	able to be forgiven or pardoned; not seriously wrong
virulent	adj	extremely infectious, malignant, or poisonous	extremely poisonous, infectious, or damaging	Extremely poisonous or venomous; deadly	highly poisonous, or extremely injurious
voluble	adj	marked by a ready flow of speech; fluent	talking easily and at length	spoken incessantly and fluently	characterized by ready or rapid speech : fluent
winsome	adj	charming, often in a childlike or naive way	attractive in a sweet, engaging way; charming	charming, because of a naive, innocent quality	sweetly or innocently charming;
abeyance	noun	temporarily set aside; suspension	temporary inactivity or non-operation	temporary inactivity or cessation	temporarily suspended or not used
acerbity	noun	sourness or acidness of taste	sourness of taste, with bitterness	sourness or astringency of taste.	a sharp sour taste
alacrity	noun	cheerful willingness; eagerness	cheerful and speedy readiness	brisk eagerness or enthusiasm	liveliness and eagerness

aphorism	noun	a tersely phrased statement of a truth	a succinct statement expressing a general truth	a concise witty remark which contains a general truth	a short clever saying intended to express a general truth
apotheosis	noun	the ideal example	most glorious example	a perfect example	an exalted example
asperity	noun	harshness or severity in manner	harshness of manner; ill temper	harshness or sharpness of manner	roughness of manner or of temper
calumny	noun	a false statement made to injure another's reputation	the making of false statements with malicious intent	a misrepresentation intended to harm another's reputation	a falsification intended to discredit another.
chicanery	noun	deception by trickery	deception by clever manipulation	deception by cunning means	deception by quibbling
comity	noun	mutual courtesy; civility	mutual civility and respect	civility; friendliness	courteous behavior; politeness;
compendium	noun	a short, complete summary	a comprehensive but brief account	a summary of essential information in brief form	a concise but comprehensive summary
compunction	noun	a strong uneasiness caused by a sense of guilt	a feeling of shame about doing something wrong	anxiety arising from awareness of guilt	a feeling of uneasiness caused by regret
curmudgeon	noun	an ill-tempered person full of resentment and stubborn notions	somebody who is irritable, ill-tempered or stubborn	a bad-tempered, disagreeable, or stubborn person	a bad-tempered, difficult, cantankerous person
derision	noun	contemptuous ridicule or mockery	contempt and mockery	mockery or scornful treatment	contemptuous or jeering laughter
dotage	noun	a decline of mental faculties associated with old age; senility.	weakness of mind or foolishness, accompanying old age.	feebleness or imbecility of the mind, particularly in old age	mental infirmity as a consequence of old age; senility
ersatz	noun	an imitation or a substitute; usually an inferior one	a substance or thing used as a substitute for something natural.	an artificial substance or article used to replace something natural.	an artificial or inferior substitute or imitation
fecundity	noun	the ability to produce offspring, in large numbers	the power of producing abundantly; fruitfulness	state of being fertile; capable of producing offspring	fertility; the power of bringing forth in abundance
folderol	noun	foolishness; nonsense	nonsensical or silly	mere nonsense; idiotic	senseless; foolish
fruition	noun	the realization or fulfillment of a plan	the manifestation of good efforts; realization	attainment of anything desired; accomplishment	realization of something worked for; accomplishment
hebetude	noun	dullness of mind; mental lethargy	the condition of being dull in mind; listlessness	mental lethargy or dullness	the state of being mentally dull; stupidity
ignominy	noun	great personal dishonor or humiliation	a total loss of dignity and self-respect	shameful or dishonorable quality or conduct or an instance of this	the condition of being in disgrace or dishonor; humiliation

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interstice	noun	a space, small or narrow, between things or parts	a small or narrow interval between two parts or things.	a small opening between two adjacent objects	a small opening or gap between two things
invective	noun	strongly abusive or critical language	denunciatory or abusive language	an insulting or abusive word or expression	an abusive, violent expression of speech
lassitude	noun	a feeling of weariness or diminished energy	weakness; lack of vitality or energy	lack of mental or physical energy; weariness	state of being tired or weary; lack of energy
onus	noun	a difficult responsibility; a burden or obligation.	a difficult or unpleasant duty; burden	a difficult or disagreeable obligation or burden	an unwanted but necessary task; burden
palaver	noun	unnecessary idle talk or chatter	empty, idle, or time-wasting talk	loud, confused and empty talk	profuse and idle talk; chatter
paucity	noun	smallness of number; fewness	smallness of quantity; scarcity	an insufficient quantity or number	smallness or insufficiency of quantity
penury	noun	extreme want; destitution	a state of extreme poverty or destitution	severe poverty; pennilessness.	lack of necessities; extreme poverty
peroration	noun	conclusion of a speech with a formal recapitulation	the concluding part of a speech; the summing up	the concluding part of an oration; a final summing up	the concluding section of an oration; recapitulation
platitude	noun	a trite or banal statement, one expressed as if it were original or significant	a pointless, or unoriginal comment or made as though it was significant.	a dull or trite remark; one uttered as if it were fresh or profound	commonplace or trite remark made as if it were important
plaudit	noun	enthusiastic expression of praise or approval	an enthusiastic show of approval; applause	enthusiastic approval; acclamation	A mark or expression of applause; praise bestowed
probity	noun	complete and confirmed integrity; uprightness	moral integrity: absolute correctness	unquestionable integrity and honesty	adherence to highest ideals; uprightness
proclivity	noun	a natural propensity or inclination; predisposition	an inclination or predisposition; proneness	natural or habitual tendency; propensity	a natural inclination; instinct, disposition
solecism	noun	a nonstandard usage or grammatical construction	a grammatical mistake	an ungrammatical combination of words	a gross violation of convention in grammar.
sophistry	noun	a tricky and superficially plausible method of reasoning that is fallacious	a method of argumentation that seems clever but is dishonest or flawed.	deceptive reasoning involving statements that sound plausible but are false.	an argument that seems plausible, but is deliberately fallacious or misleading.
spate	noun	a sudden flood, rush, or outpouring	an unusually large outpouring; surge	sudden, almost overwhelming, outpouring	a sudden or strong outburst ; rush
temerity	noun	foolhardy disregard of danger; recklessness	reckless boldness; rashness	rash disregard for danger; foolhardiness	reckless boldness; foolish bravery

truculence	noun	a disposition to fight, especially fiercely.	state of being aggressively hostile; belligerent.	an inclination to fight; belligerent	a disposition to exhibit violence or fierceness.
turpitude	noun	extreme depravity or evilness	moral baseness; depravity	extreme immorality or wickedness	depravity; wickedness
umbrage	noun	anger or resentment that comes from being offended	resentment or annoyance arising from some offense	an annoyance due to rudeness or disrespect.	a feeling of offense, irritation, or resentment
vicissitude	noun	a change or variation	variation or fluctuation	interchange or alternation	constant change or alternation
abjure	verb	to repudiate or renounce solemnly, as under oath;	to renounce or give up under oath; forswear	to renounce or reject with solemnity; to recant	to give up under oath; renounce; reject
abrogate	verb	to abolish or annul by authority.	to abolish by formal or official means	to annul or repeal by an authoritative act	to cancel or repeal by authority
abscond	verb	to escape or run away in secret	to depart secretly and hide oneself	to depart in a sudden and secret manner	to leave quickly and secretly
aggrandize	verb	to increase the scope of; extend.	to make greater : increase, enlarge	to widen in scope; enlarge; extend--	to increase or become greater; enlarge
ameliorate	verb	to make or become better; improve	to make better or more tolerable	to make a bad or unpleasant situation better	to make or become better; more bearable
assuage	verb	to make (something burdensome or painful) less intense	to provide relief from something distressing or painful	to make less severe or more bearable; alleviate	to lessen the intensity of (something that pains or distresses)
beleaguer	verb	to harass; beset	to annoy or harass	to annoy persistently	to harass or tease
chide	verb	to scold mildly; reprimand	to disapprove or reproach in a constructive manner	to reproach or scold somebody gently	to scold; to reprove mildly
demur	verb	to voice opposition; object	to express disagreement or refusal	to object, challenge or indicate opposition	to scruple or object; take exception
disport	verb	to amuse oneself in a light, frolicsome manner	to enjoy oneself unrestrainedly; frolic	to amuse oneself in light or lively fashion	to indulge in amusement; play; frolic
elucidate	verb	to make clear or plain, by explanation	to make clear or obvious; to clarify	to make lucid or clear; explain	to make clear or intelligible; to illustrate
enervate	verb	to weaken or destroy the strength or vitality of	to deprive of strength, force, vigor	to weaken physically, mentally, or morally vitality	to take away the strength or vitality of; weaken
ensconce	verb	to settle securely or comfortably	to settle snugly or securely	to position firmly or comfortably	to situate in a comfortable place or position
exculpate	verb	to clear of guilt or blame.	to free from blame or accusation of guilt	to clear from alleged fault or guilt	to free from blame; prove guiltless

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expiate	verb	to make amends or reparation for; atone	to make amends, or show remorse for wrongdoing	to atone or make reparation; suffer punishment	to appease guilt for wrongdoing, to make amends
extirpate	verb	to destroy totally; exterminate	to completely get rid of; destroy	to remove totally; do away with	to destroy completely; to annihilate.
flout	verb	to show contempt for; scorn	to mock; show scorn	to show contempt or disregard	to mock; scoff; ridicule
gabble	verb	to speak rapidly and incoherently	to talk fast and foolishly	to speak quickly and not clearly	to converse rapidly and unintelligibly
gainsay	verb	to declare false; deny	to contradict; to deny	to deny or dispute	to contradict; take exception to
indemnify	verb	to make compensation to for damage, loss, or injury	to reimburse after loss, damage, or liability incurred	to repay for what has been lost or damaged; compensate	to compensate for damage or loss sustained, expense incurred
ingratiate	verb	to gain favor or acceptance by deliberate effort	to bring into favor or good graces by conscious effort	to gain favor or approval with by deliberate efforts	to make an effort to please in order to gain favor or acceptance
Inveigle	verb	to win over by coaxing, flattery, or artful talk	to obtain by clever talk or flattery	to acquire by ingenuity or flattery :wangle	to obtain through guile or coaxing
maunder	verb	to talk incoherently or aimlessly.	to talk in a vague or incoherent way	talk in a rambling or aimless manner	to speak indistinctly or disconnectedly
obtund	verb	to blunt, dull, or deaden	to make blunt or dull; make less acute	to reduce the edge of; dull	to make less intense; dull or deaden
obviate	verb	to anticipate and dispose of; render unnecessary.	to anticipate and prevent or make unnecessary	to do away with or prevent; make unnecessary	to prevent or eliminate in advance; render irrelevant.
palliate	verb	to make less severe or intense; mitigate	to lessen; make less severe; alleviate	to make less intense; relieve; mitigate	to reduce the intensity or severity; alleviate
palter	verb	to talk or act insincerely or misleadingly.	to act or talk insincerely or deceitfully	to talk or act insincerely; prevaricate	to speak or behave insincerely; misinform
pillory	verb	to expose to ridicule and abuse	attack or ridicule publicly.	to abuse or criticize in a public way	to mock or criticize strongly, in public
promulgate	verb	to make known by declaration; announce officially	to make known by open declaration; proclaim	to make known by open declaration; publish	to proclaim or declare officially; publicize formally
putrefy	verb	to cause to decay and have a foul odor	to decay, producing an unpleasant smell	to decay with an offensive odor	to decay with a foul smell
rankle	verb	to cause persistent irritation or resentment.	to cause feelings of bitterness, or resentment	to cause annoyance or resentment.	to cause irritation or deep bitterness
renege	verb	to fail to fulfill a promise or obligation	to go back on a promise or commitment	to break a promise or commitment	to fail to keep a promise or an agreement

repine	verb	to be discontented or low in spirits.	to feel or express dejection or discontent.	to express or feel unhappiness; complain	to be discontented; fret
requite	verb	to make repayment or return	to pay back; fulfill	to repay; to recompense	to repay; to return
revile	verb	to assail with abusive language; vituperate.	to make a fierce verbal attack	to criticize someone strongly,	to speak with hostile insults
stultify	verb	to render worthless or useless; cripple	to impair or make ineffective	to render futile or ineffectual	to deprive of strength; make useless
titivate	verb	to make decorative additions; spruce up.	to improve appearance by adding decoration or neatening	to dress up; spruce up	to make dapper or trim; spruce up.
triturate	verb	to rub or crush into fine particles	to grind or rub into a fine powder	to pulverize by rubbing or grinding	to reduce to fine particles by grinding.
vitiate	verb	to reduce the value of; contaminate; spoil	to make imperfect; spoil; corrupt	to impair the quality of; make faulty; spoil	to harm the quality of; mar; spoil
wheedle	verb	to endeavor to influence someone by flattering or beguiling	to persuade somebody to do something using flattery or guile	to persuade someone to do something by using endearments or flattery	to try to persuade someone to do something by praise or charm

Table 20. Low Constraint Sentences

Target Word	Context 1	Context 2	Context 3	Context 4
assiduous	After many long hours of concentration, the _____ doctor successfully completed the delicate surgical operation.	He attempted to show himself as a(n) _____student of martial arts by earning a respectable score on Saturday's match.	To maintain her healthy weight, a(n)_____ approach in what she ate and how often she exercised.	The women, _____ and determined, were working to rebuild some of the homes after the storm.
baleful	The book explores the _____ effects of adopting such a policy on the world economy.	The _____ weather report showed details of the hurricane's estimated landfall and projected damage to the town.	The prophet' s _____ vision contained warnings of violence and war to the nation.	His _____ facial expressions were clues as to what may happen in the future.
bawdy	In attempt to avoid _____ statements from either side, the families wanted a mediator to be present.	He turned the common tale into a(n) _____ story to entertain the teenage crowd.	The content of 15th century plays usually catered to the _____ crowd and their type of wit.	The director of the production was surprised that the singer chose a _____ song for his audition piece.
caitiff	Only smaller boys with a timid nature were targeted by the _____ bully.	The _____ boss forced his new interns to fire the nice employees for him.	She was surprised that he would let his reputation be defined by _____ behavior for the rest of his career.	The boys proceeded with the rest of their peers rather than to be referred to as _____ by their classmates.

chary	Given her training in public relations, she insisted on being _____ when she met new people.	In their English class, the kids were _____ about their use of commas in their essays.	The reporter was too _____ to ever really get to the bottom of a controversial story.	Although it was not obvious to most, she was very _____ of random compliments.
churlish	The neighborhood was frustrated by the _____ teenagers who played loud music into the night.	The street vendor approached his customers in a _____ way once they got to the front of the line.	It was a surprise to her that her _____ co-worker was responsible for bringing in the most revenue this month.	She instructed all employees to avoid _____ responses to customer's questions
cogent	The journalist's _____ critique of the unpopular study was able to show readers why the methods were justified.	The politician had a(n) _____ explanation of his plans for the economy during the debate.	During the debate, the politician's _____ outline of his personal strong points impressed voters and renewed their confidence.	The salesperson had a(n) _____ way of speaking that allowed him to successfully address any customers questions.
desultory	She hated going to the store with her brother because his _____ shopping style made her dizzy.	The student filled his paper with _____ writing on the topic he'd missed to reach the required length.	His _____ way of accomplishing tasks was sometimes difficult to handle.	She found her friend's _____ and odd behavior to be entertaining at times.
diffident	The struggling student had a(n) _____ attitude when approaching the university representatives at the college fair.	The smart girl does not have a(n) _____ attitude regarding her future performance as a college student.	The poor man's _____ attitude towards himself prevented him from wanting to visit his richer relatives.	Her sometimes _____ behavior was mistaken by others as lack of interest.
doughty	A commander hopes for _____ soldiers in order to persevere in any conflict.	She listened to her _____ little sister claim that she can ride the biggest rollercoaster in the park.	Taking to the school bully at recess was a _____ thing to do.	Her _____ behavior overseas were recognized by several newspapers and local news shows.
ebullient	The school hosted a pep rally to bring a(n) _____ spirit to the campus the day before the big game.	She had no problems working at the shelter with the animals due to her _____ personality.	The teacher's _____ style was enough to wake up all the students during first period.	Her _____ energy for playing the piano was pleasing to her teacher.
edacious	People that are trying to lose weight are advised to temper their _____ appetites by not overindulging.	The salad bar did little to lessen her _____ hunger after the 24-hour fast.	The child's _____ eating habits caused his doctors to worry that he would develop obesity.	It was apparent that his current state of healthy was a result of the _____ way he approached food.
erudite	He decided to refer to the most _____ source to get an informed explanation of the phenomena.	She desires to be an expert in her area so she can add many _____ insights to the field.	The _____ professor piqued his students' interest in the mysteries of philosophy.	The boy's parents advised him that the best colleges look for the most _____ students.

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fractious	The puppy had to be kept in a pen because she often became _____ around strangers.	The police had to forcibly restrain the _____ teen who continued to resist their efforts.	Being responsible for a pack of _____ 6-year-olds can be one of the most tiring occupations around.	The old man had become increasingly _____ in recent years as his mobility decreased.
indubitable	He tried to teach his children _____ and important knowledge about how evolution works.	A soldier's loyalty to his country should be _____ no matter what circumstances challenge his allegiance.	The _____ arguments by the student got her the points back on the exam question.	He was so _____ in his beliefs that no one could sway him on any point.
inimical	During the meeting her _____ actions were targeted at the reputation of the other lawyers.	She used words during their fight that seemed _____ to make her disapproval very clear.	The opposing team's _____ intentions were made obvious by their plans for a surprise attack.	He was surprised by the _____ voice of the customer service helpline representative.
insipid	After tasting the _____ dishes at the health foods cafe, she craved the food of her homeland.	To be polite, the boy pretended his mother's _____ dish was better than it was.	Sometimes teenage girls can seem completely _____, as if nothing is going on in their heads.	The remake of the famous song was seen as an _____ version of the original.
jejune	The judges found that _____ contestants stuck in their minds much less throughout the beauty competition.	The critic disliked the ____ movie since it failed in its claim to help global affairs.	She found her blind date's personality incredibly _____ and asked for the check as early as possible.	He exhibited _____ behavior in handling the situation with his coworkers.
laputan	The manager didn't want to hear any _____ ideas because of the pressing financial issues at hand.	Children often imagine _____ plans for their future before they begin to understand the world.	She remembered his last _____ proposition and listened skeptically to the latest idea he'd cooked up.	Fairy tales often have a _____ quality that makes them appealing to imaginative young children.
lugubrious	He broke up with his distant girlfriend through email because he knew he would be too upset by her _____ reaction.	Her _____ mood was unnecessary after staining the sweater she had gotten in the store that morning,	This new tragic play evokes sadness in a simple way, instead of with the _____ acting used in traditional tragedies.	This new tragic play is simple and direct in contrast to the _____ acting used in traditional tragedies.
mendacious	She often ignores _____ tabloids that she sees in the supermarket.	It was _____ of her to report Saturday night's incident to the police.	They decided he was a(n) _____ right from the start.	I could tell that the note she left had _____ information about me.
mephitic	The scientists working in the animal lab often have to clean up _____ substances.	Though sulfurous hot springs can be very therapeutic, many people find their odor too _____ to be around for long.	She came prepared with her gear to complete the experiment that includes handling _____ substances.	He found himself to be surrounded by _____ scum every time he took his boat out on the rivers.

nugatory	Her "problems" were always so _____ that eventually her friends stopped caring.	The professor assured the student that the chapter was _____ enough not to worry about.	The production of PDA's has become _____ with the invention of the smartphone.	Her lease was _____ once the apartment building was sold to a new owner.
obsequious	Although their father desired _____ responses to his every order, the children fulfilled their duties grudgingly.	The teacher was liked by everyone, but the _____ student always catered to his every whim, earning him the nickname, "teacher's pet."	The _____ waiter went almost over boarded in his helpfulness.	The intern was as _____ as he possibly could be, hoping that he would climb the ranks quickly and eventually order his own staff around.
odious	The shocked audience found the performer's _____ material to be highly offensive and refused to return to the establishment.	The more they listened to the sordid details, the more the jury felt the _____ defendant had to be guilty.	She liked to refer to her mother-in-law's cooking as a(n) _____ mess.	When his name was mentioned, she felt a(n)_____ feeling that she could not deny.
peremptory	Her _____ remarks concerning healthcare reform struck silence during a heated discussion.	The chairman left the board meeting after his _____ statement about selling the company.	She was hoping that someone would make the necessary _____ move so they could move on.	His mother wondered whether his desire to move out was _____ or if he will change his mind.
perfunctory	It is clear the doctor is running late because he offers only _____ sympathy to each patient.	Often married couples complain that their romantic lives become reduced to _____ acts of affection with their busy schedules.	The telemarketer gave _____ responses to my questions as if he was reading from a script.	The girl's manager eventually decided to speak to her about all of the _____ mistakes she had been making
petulant	Teenagers tend to become significantly more _____ around their families than other age groups.	The manager fired his _____ employee after embarrassing the company at a board meeting.	Age 2 is considered by many parents to be the age when children are most _____.	The older man's seemingly _____ demeanor was just a cover for a kind heart.
propitious	She was looking for a _____ and good time to leave the party.	Due to his current financial state, it was a _____ time for him to open a new business	The _____ beginning of the movie instantly grabbed the audience's attention.	It is a special talent to foresee _____ circumstances and to take action.
punitive	She ignored her mother's _____ threats about being grounded and ran up the stairs to her room.	His mocking faces seemed to be a(n) _____ attempt to her give her a taste of her own medicine.	The children felt the idea of homework was _____ rather than being beneficial as an educational tool.	He tried to get back at her with his _____ actions after she betrayed him once again.
querulous	When the dog's _____ behavior finally awoke her owner, he would grudgingly take her out for a walk.	The family's _____ comments to the restaurant manager allowed them to get a free meal.	She couldn't stand how _____ her mother-in-law always was on her visits.	The parents knew their young son would become very _____ if he didn't get his way.

reticent	The teacher's goal was to interest the more _____ students in the class activities and discussions .	They thought she didn't like them in general, but it turned out she was just _____ in general.	His persistent charm eventually broke down her _____ facade and they slowly became friends.	The news cast left the family _____ and in shock.
sagacious	The _____ woman decided to wear comfortable shoes even though they were unattractive.	The professor chose the most _____ papers to be used as examples in later years.	His _____ plans were quickly put into effect at his new company, and gained him a swift promotion.	They were outright _____ to avoid any confrontation with their next door neighbors.
sonorous	The casting director was looking for someone who could give a(n) _____ delivery of the rather pompous character's lines.	Some people remember the more _____ candidates because their speeches are more impressive.	The powerful executive expected a(n) _____ greeting from the representatives from the smaller company hoping to make a deal.	The experienced orchestra's performance was _____ and impressive as they played the powerful composition.
stolid	Her _____ way of conversing made it seem like she didn't care about making new friends.	Even winning the lottery wouldn't affect the _____ expression he puts on in front of people.	She didn't look like she wanted to meet new friends from her _____ way of talking to people.	Her _____ approach to the situation got absolutely nothing accomplished.
turbid	The movie left her a bit more _____ about the issues of global warming.	After waking up from a bad dream the boy was _____ and muttered to himself for a while.	It can actually be less effective to cram because your mind is all _____ after a long night of studying on little sleep.	The movie left her a bit more _____ about the issues of global warming.
venial	The daughter argued that the fender-bender was a(n) _____ mishap and could have happened to anyone.	Bluffing is considered a(n) _____ type of lying that usually happens in the context of a game.	After a long day at work the woman couldn't be bothered with the _____ details of her friend's day.	As part of her treatment, she was encouraged to disregard the _____ mistakes of every day life.
virulent	Her attitude and behavior was _____ and had an effect on everyone around her.	The _____ nature of the bees prompted the need for action from the state governor.	The _____ atmosphere at the business meeting left everyone on edge.	She did not expect such a clean animal to carry _____, but necessary germs for its protection.
voluble	She knew some of the material, but managed to sound quite convincing by writing a(n) _____ essay.	The elderly man was known for engaging in _____ conversations with anyone he could find to listen to him.	The debate team was looking for someone who was _____ and smart.	While attending a rally, she was annoyed with the _____ speech given by one of the presenters.
winsome	She tried to beguile the policeman with a(n) _____ smile and demeanor to avoid getting a speeding	The teacher's _____ way of talking to her students made her lectures more enjoyable.	The celebrity's _____ looks made her the perfect candidate for movies aimed at younger	Her personality and _____ smile captured the hearts of many.

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	ticket.		audiences.
abeyance	Her duties as manager were under _____ until she returned from maternity leave.	They agreed to put the man's sentence on _____ while he got treatment and counseling.	Many outdated laws in our legal system are in _____ because they are irrelevant.	It seemed appropriate that access to the park would be in _____ during the winter months.
acerbity	By the _____ of the tone of her voice, it was apparent that she was jaded with the system.	His _____ and temper flared when he saw the neighbor's dog digging in the yard.	The _____ in his voice indicated that something else was going on besides losing his glasses this morning.	She tended to show _____ in her speech, often alarming people to her condition.
alacrity	On their first day of work, the inexperienced interns worked with _____ on everything that was asked of them.	Her love for her work was apparent in the _____ with which she performed her duties.	If you want to respond to an invitation with_____, then is it a good idea to respond promptly.	After the hometown team won the championship, the bar erupted into _____ which lasted for the rest of the night.
aphorism	She expected her grandfather to answer with a(n) _____ to her big questions about life.	The rabbi always tried to include a(n)_____ in his Sabbath sermon to inspire the local community.	The candidate's optimistic campaign _____ caused many people to see him as a source of hope and change.	Instead of offering advice from her own life experience, she used _____ to motivate people.
apotheosis	The pleased movie-goer predicted the much anticipated film would soon be recognized as the _____of the action movie genre.	There are many countries that consider American rights, such as freedom of speech, the _____ of democracy.	The painting done for the _____ of the Roman Emperor was housed in the temple erected in his honor.	The _____ of professional sports players as role models has become widespread in younger generations of aspiring athletes.
asperity	The normally level-headed teacher spoke to the students with _____ to communicate the extent of his disapproval of their behavior.	The irritated mother controlled the usual _____ of the tone she used to discipline her oldest because the newborn had just stopped crying.	The over-protective father's questioning was filled with _____ whenever he spoke to his daughter's new boyfriend.	In his speech, he expressed with _____ his opinions about the recent merger with the bank.
calumny	The _____ that the high-profile couple were hurling at each other reached the papers the next morning.	In some cases, _____ may result in financial penalty or arrest.	Some degree of _____ is expected during times of national elections.	They viewed his recent comments to be _____ of the current policies of the company.

chicanery	Years of observing the _____ of others had hardened the southern gentleman into becoming an immoral lawyer.	The lobbyist showed that he would stoop to any level of _____ when trying to rally government officials to his cause.	He used _____ to convince people that his goods were worthy of buying.	At his interview, he resorted to flattery and _____ to win the job.
comity	To promote _____, most cities do not allow persecution of any types of ethnicities or religious creeds.	She expected to be greeted with _____ as she entered the room.	The governing board established the new group to establish _____ between the neighboring towns.	She told her kids that if they couldn't manage to get along in _____ with each other they would not go to the movie that afternoon.
compendium	The trailer acted as a(n) _____ for the upcoming new movie.	The _____ for the scholarly article sounded highly interesting to the student.	Their _____ of the plan sounded like a suicide mission to the rest of the gang.	The former band members reunited to release an album that would be a(n) _____ of their earlier hits.
compunction	He suggested that they leave their _____ and forge ahead with the plan.	She resisted any feelings of _____ and proceeded on her next journey.	Even though his _____ told him it was wrong, he couldn't keep himself from calling her.	Philosophers claim that humans' ability to feel _____ differentiates them from other species.
curmudgeon	Besides having an uncle who was a bit of a(n) _____, the girl was from a very agreeable, pleasant family.	Having a _____ for a boss makes it difficult to look forward pleasantly to coming to work every morning.	He is a world-class a _____ who deconstructs the world around him.	The bitter old man showed his _____ personality any time someone asked for a favor.
derision	She tended to attract _____ due to her choice of style of dress.	The reception of the new show was met with _____ by many audiences.	The opponents peered with_____ in their eyes at the terrified men.	Her snooty _____ of his work eventually caused a lot of resentment and hurt their relationship.
dotage	The _____ people experience at the very end of their lives has been compared to their state when they come into the world.	His _____ that came with advancing old age confined him to a wheel chair to get around.	The _____ people experience at the very end of their lives has been compared to their physical state when they enter the world.	The _____ people experience at the very end of their lives has been compared to their state when they come into the world.
ersatz	The _____ people used the _____ for his fabric choice since he needed to save money.	The _____ purse only cost her thirty dollars instead of three hundred.	Since smoking a Cuban cigar is illegal in the US, it is common for people to find a(n) _____ version to smoke instead.	The _____ purse only cost her thirty dollars instead of three hundred.

fecundity	Male species of birds can use feather color to determine the _____ of a potential mother and mate.	Many people feel that caffeine helps their _____ during the day.	Companies often bring in outside experts to streamline the _____ of their businesses.	Many people feel that caffeine helps their _____ during the day.
folderol	The boy was scolded for the _____ of his comments during the otherwise intelligent class discussion.	The writer was fired from the television show because his _____ was disrupting the intellectual tone of the show.	He clearly wasn't smart enough for her taste after the _____ of his conversation at dinner.	Comedians sometimes spout _____ between jokes in their routines to draw a few laughs while the audience tries to make sense of them.
fruition	The painter was excited for his career-long goal to come to _____ once his exhibit opened in the gallery.	The parents were gratified to see that their son had developed into _____ while away at his first year of college.	The amount of _____ he experienced at his job was not nearly enough to warrant staying.	The museum committee made sure that _____ was conceivable with their new gallery plan.
hebetude	After pulling an all-nighter, the _____ of the student's mind kept her from having time to finish the test she had studied for.	The _____ resulting from her depression kept her in bed, completely inactive for the majority of the day.	After pulling an all-nighter, the _____ of the student's mind kept her from having time to finish the test she had studied for.	The _____ resulting from her depression kept her in bed, completely inactive for the majority of the day.
ignominy	The team suffered _____ at the hands of their most bitter rivals.	He left his girlfriend in _____ with her family by getting her pregnant.	The _____ of the event scarred her emotionally for years.	The once-respected company had fallen into _____ in recent years.
interstice	If it were not for the size of the _____ of the sink hole, her ring would have fallen into the plumbing below.	If it were not for the size of the _____ of the sink hole, her ring would have fallen into the plumbing below.	The little boy tried to look through the _____ but couldn't see anything.	They stored the extra linens in the _____ under the stairs.
invective	The disgruntled citizens made sure that the _____ in the letter was clearly directed at the president.	She poured forth her _____ against her slovenly husband one night.	Troublesome children often experience an unfortunate amount of _____ from their caregivers.	The coach's frequent _____ of his players did little to encourage them to do better.
lassitude	She believed her _____ was due to the increased hours she was working at her job.	Some times vitamin deficiencies can induce a state of _____, but often times, this can be easily treated.	The dog's _____ increased steadily with his advancing age.	The extravagantly wealthy queen made good use of the luxury to lay around in a state of _____ for most of the day.
onus	The new law placed increased _____ on the motorists to disclose medical conditions that could	Having pleasant and good manners is not a(n) _____, it is a skill that is important.	Even thought it may be unwanted, having a (n)_____ sometimes leads to positive outcomes.	The _____ of the situation became undeniably obvious to everyone involved.

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	affect their driving.		
palaver	The teenage girls' _____ drove the man sitting behind them crazy.	The pleasant hum of _____ coming from the office floor boded well for morale.	It was clear that the executives' _____ would have far-reaching consequences for the company's many employees.	The _____ of voices coming from the other room was very distracting to the students taking their exam.
paucity	The _____ of the soldiers' reduced rations began to cause malnourishment and impact their ability to keep in fighting form.	Children, unlike adults, can learn language when there is a _____ of the spoken language in the home.	The _____ of ingredients was no challenge for the famous master chef.	It is _____ that maintains the worth of many products and goods that we own.
penury	The _____ in developing third world countries remains a serious humanitarian issue.	What may be considered as _____ is dependent on the individual's personal opinion.	She wanted to go to a high school that did not have a _____ of teachers in the arts.	The _____ of the desert allows only the hardiest of plants and animals to survive.
peroration	The forceful _____ that finished off the citizen's long letter of grievances had the most impact on the congressman's vote.	To finish on a powerful note, the petition's _____ bluntly and ominously stated that there was only one correct path.	The citizens hoped the strongly worded _____ of the bill being sent to Congress would be enough to sway their representatives.	The thesis defense was going to be the _____ of all of the time and effort she had put into grad school.
platitude	The spontaneity of the receptionist's greeting turned into _____ after days of repeating the same welcoming phrase.	Politicians tend to answer tough questions with some well-rehearsed _____ when they lack the time to prepare.	The acquaintance, not knowing the situation, could offer only an overused _____ which did nothing to console the family about their recent loss.	During the discussion of a well known topic, the student regurgitated a _____ he hoped would impress the teacher.
plaudit	Her son felt he should get _____ for cleaning his room without being told.	The athletic director hoped to receive _____ for the energy he had invested in the high school sports program.	The actors received a lengthy _____ at the end of the night.	Her paper received the highest _____ for a scientific paper this year.
probity	The parents were proud to see that their son conducted himself with _____ in the cutthroat business world.	He was admired for his _____ during situations that challenged his upbringing.	Her approach to her journalism work was to report with as much _____ as possible.	The _____ that she brought to the company was refreshing and soon elevated production levels greatly.

proclivity	The students had a _____ for hanging out at the restaurant down the street.	She had a(n) _____ for cookies just the way her mother had made them.	His _____ and interest for the business world helped him immensely in his current job.	Her sweet _____ regularly won her friends among new groups of people.
solecism	The teacher instructed the class not to include any _____ in their formal research paper.	Many people point to texting as the cause of the _____ of our language.	The _____ of his speech often turned girls away from him on dates.	The cast wrote the last scene off as a(n) _____ and kept shooting.
sophistry	Novelists often include _____ in their stories to further the plot and add a twist to the action.	Cult leaders are usually adept at _____ because they are able to involve large groups of people despite having questionable causes.	It can be disastrous to have trusted advice that turned out to be full of _____, especially when the matters concerned money.	Many people feel that successful lawyers are just masters of _____ and so are able to win complex cases.
spate	The new laws have caused a _____ of riots and robberies over the last week.	A(n) _____ of strong leaders allowed the budding nation to take firm root.	A(n) _____ of strong leaders allowed the budding nation to take firm root.	The _____ of crimes in the urban area had law enforcement officials baffled.
temerity	The coach couldn't believe the player had the _____ to head towards the goal despite the oncoming pack of defenders.	The _____ of the business move ended up being successful because it caught competitors off guard.	The teacher was shocked at the _____ of the student's tone with him.	The extreme _____ of the girl's words really hurt the two friends' relationship.
truculence	Army generals are stereotyped as being full of _____ and always quick to resort to arms.	The _____ of the two little boys led their teacher to keep them separated to avoid conflict.	For years, military staff has been infamous for their _____ while dealing with prisoners of war.	The _____ between the two parties was making it very difficult to reach any sort of agreement.
turpitude	The _____ shown by drug traffickers usually spreads throughout the people they are connected with.	She was convinced that the candidate's history of moral _____ would cost him winning another term in office.	An act of absolute _____ would be committing a crime against innocent children.	Religions across the world have been concerned with helping people overcome the _____ of their instincts.
umbrage	As the day wore on she had more and more trouble hiding her _____ at the whole situation.	Her _____ caused by her friend's tone of voice caused her to snap back at her in kind.	Her _____ at her friend's tone of voice caused her to snap at her in kind.	As the day wore on she had more and more trouble hiding her _____ with the whole situation.
vicissitude	The young lady's lifestyle had undergone such _____ that her friends felt they hardly knew her.	In order to call him out on his erraticness, he kept track of each _____ in his opponent's stance on important issues.	Meteorologists attempt to predict the _____ of the weather for the public knowledge.	Meteorologists attempt to predict the _____ of the weather for the public knowledge.

abjure	The political candidate called a press conference in order to _____ his former support for the war to the voters.	The born-again Christian rapper decided to _____ drug and alcohol use in his new lyrics.	The threat of religious persecution forced Galileo to _____ the scientific theory of a heliocentric earth.	She wanted to _____ her childish thinking and ways so she can be taken more seriously.
abrogate	The day after they impulsively wed, the couple decided to _____ their marriage license and wait a while longer.	War-mongers prefer to believe that any verses in the Bible which call for peace are _____ by verses that call for war.	People forced the government to _____ laws against alcohol by not conforming and creating their own.	The boy asked the principal to _____ the detention slip his teacher had given him.
abscond	After he received his pay, the man decided to _____ a different location.	She was surprised that her sister decided to _____ with the bracelets, because she never wears them.	Because her parent's questioned her motives, she decided to _____ to avoid any misunderstandings.	As people began to fill the room, she decided to _____ before the show started.
aggrandize	The poster _____ the magnitude of the title bout months before the blockbuster was set to take place.	He hoped they would _____ him publicly for all of the time he had dedicated to the team over the years.	The actor was very humble and never made an attempt to _____ himself in the eyes of everyone else.	They felt that they had to _____ in order to establish themselves in the new place.
ameliorate	She was disappointed in the new treatment that is supposed to _____ the effects of prolonged drug use.	Her goal was to come up with a way to _____ the dog bathing situation.	It is amazing that a hot meal can _____ the discomfort of a very cold day.	A smile can usually go a long way in being able to _____ most situations.
assuage	People often hope to _____ the consequences of a tragic event by offering aid.	People often try to _____ the guilt of wrongdoing by doing something noble.	By doing activities that she enjoyed, she was able to _____ the feelings she had about her job.	The man made sure to _____ the situation before the discussion among his friends could develop any further.
beleaguer	The teacher set up some rules to encourage students not to _____ each other during class.	The spectators who wanted to _____ the actors were asked to return their tickets.	His father warned that the mosquitoes would _____ and bite him if he dared to approach their nest.	The children did all that they could to _____ their mother until she gave in to their demands.
chide	I noticed his serious mistake right way, however I avoided_____ him for it this time.	The residents of the wanted to _____ the heads of state for disallowing the death sentence.	She wanted to _____ her boyfriend for forgetting to pick her up from the airport.	After her father made sure to _____ her, she decided to go discuss the matter with her friends.
demur	The council did not _____ once the mayor explained that the expense would be covered in the city budget.	The defendant had no grounds by which to _____ to the witness's account of the story.	They wanted to nominate him for treasurer of the society, and he had to_____ the idea.	Her plan was to apply to out of state colleges, but her parents had to _____ her plan.

disport	Children have a better ability to _____ themselves to recreational activities than adults.	Children are more able to _____ themselves in situations where adults may not be able to do so.	To be truly happy in life, you must be able to _____ yourself when no one else will.	When her mother went in for her appointment, the little girl wanted to _____ herself with the other people around.
elucidate	She wanted to _____ the fact that the wounds on the body ruled out suicide.	The results of the research study would help to _____ the relationship between both variables.	The point of the meeting was to be _____ by the supervisor on our floor.	Everyone was excited that he was willing to _____ the schematic of the building again.
enervate	She knew that watching her husband's heart surgery would _____her so she made sure to sit down before it began.	The young boy will often _____ his mother to the point where she needs someone's help to watch him.	The prolonged exposure to the sun and dehydration _____ the crew, causing them to remain stranded.	He tried to _____ and beat his opponent using martial art tactics.
ensconce	She made sure to _____ her cat in preparation for the long ride ahead.	The nurses had to _____ securely on the bed before he went to surgery.	Bacteria can _____ themselves into any small scratches that are made on your cups or silverware.	She found that her size was an advantage because she could _____ herself in almost any type of spot.
exculpate	She knew there was no hope that her boss would_____her because the customer is always right.	The judge asked whether the first statements made by the witnesses are sufficient to _____ the defendant.	She wondered whether to _____ the girls for how handles themselves at the party.	She was eager to help and try to _____ her client because it would show her skills in this line of work.
expiate	All the volunteer work he completed did nothing to _____ the feelings he had about the crime.	Time in jail is usually supposed to help prisoners _____ their guilty associated with the crime.	She was unsuccessful in finding a healthy way to _____ for the events in her life.	Usually the best way one can free their conscious is to _____ for their actions.
extirpate	If he was able to _____ her earlier than he did, he would not be in this situation.	He insisted that he had a plan to _____ crime in the city, but most were doubtful.	No one would have guessed that ants could _____ many of the other organisms living in the soil.	The new rules of the game were to to _____ the men on the field to earn points.
flout	The student repeatedly interjected in order to blatantly _____ the professor's thoughts on the lofty subject.	The lawyer warned his client not to _____ the judge's ruling while still in the courtroom.	There are still drivers that choose to _____ and break the law by driving while talking on their cellphones.	On the last school day of the year, the kids tried to _____ the principle and the teachers.

gabble	Politicians hire speech writers that ensure they do not _____ while presenting their ideas in important speeches.	She needed to get some coaching to learn how to not _____ while giving presentations.	She tends to _____ when she gets excited about a topic, making it hard for us to understand and keep up with her.	Auctioneers must be careful that they do not _____ or else their audience will not understand them.
gainsay	No one ventured to_____the missionary, whose excited tone contrasted curiously with his naturally calm visage.	The problem with the system is that no one dares to _____ and change what has already been put in place by previous employees.	It is impossible to _____ the facts when you have seen them with your own eyes.	It was a part of her training to _____ opinions when she thought they can be improved in some way.
indemnify	They were concerned about good business practices, thus they made it a point to _____ their customers whenever necessary.	For the first time, a law passed in order to _____ the trustees for any legal expenditures.	Mary's responsibility was to _____ individuals based on a waiting list generated by her supervisor.	It is unlawful for not to _____ the victim's family when the tragedy happened overseas.
ingratiate	The new employee tried to _____ his new supervisor by constantly offering to get something for him.	His grandparents knew that he only wanted to _____ himself with the family in order to be left in their will.	Concerned about the upcoming re-election, the candidate took great steps to _____ himself with the new voter demographic.	The bride made an effort to _____ herself with her new mother-in-law, forming a strong and lasting bond.
inveigle	Her friends gave in to her idea because she was able to _____ them into thinking they will get half of the earnings.	The young lady was able to _____ shoppers to her shop by decorating the front window in an appealing way.	She felt uneasy that co-worker that tends to _____ to get promotions and raises.	He successfully was able to _____ his way into marriage with the daughter of the the town's mayor.
maunder	The police listened to her _____ through the details of how the accident happened even though she was drunk.	John has the tendency to _____ about unimportant and time consuming things.	It is easier sometime to listen to family members _____ about their lives than to interrupt them.	The conversation quickly began to _____ when their co-workers entered the room.
obtund	The medication was supposed to _____ the pain by releasing endorphins and relaxing her muscles.	The last thing a chef would want to do is _____ the knives she used to cut meat.	His failure to _____ the effects of the drug cost him his job at the clinic.	She wanted to _____ her feelings on the matter in order to concentrate on her exam.
obviate	The anticipated closings due to snow may _____ the need to call in sick tomorrow.	Astronomers decided to _____ the confusion about the names of the stars by using numbers instead.	Vaccine shots play an important role to help _____ the need to be admitted to the hospital.	They hoped that they would answer many of their questions or even _____ their need for another visit.

palliate	She tried to _____ the incident last night with her coworkers by bringing treats to work.	Unfortunately the measures taken to _____ the situation were short term.	Roberta tried to_____ her actions with explanations and apologies, but I refused to accept her excuses.	Sometimes there are no good ways to _____ a situation that has already happened.
palter	He was trained to be able to _____ when necessary to gain access to confidential government information.	During their campaigns some presidential candidates _____ their answers while addressing controversial topics.	His aim was to _____ with buyers in order to sell his furniture before he moved.	A good lawyer will always be able to _____ the truth in order to win a case.
pillory	Pro-life supporters like to _____ women who have had abortions in their rallies by using graphic signs.	The judge would often _____ the defendant to inappropriately prove his power during the trial proceedings.	The point of the training was to learn how to _____ you opponent till the point of mental exhaustion.	She felt justified to _____ the white house press in her article about modern journalism.
promulgate	Many preachers consider it their main duty to _____ the principles of Christianity to the broader community.	He avoided trying to _____ rules for good business practices publically, instead he chose to lead by example.	One of the functions of the news media is to _____ the winners of the Academy Awards.	The senator was invited to speak in order to _____ the new agenda concerning the environment.
putrefy	Rich soil is the by-product of animals that _____ deep in the earth.	They increased the amount of bacteria in the dish to help _____ the sample more quickly.	His wound began to _____ when it was left uncovered for days.	Milk takes a long time to _____ because of the way it is processed.
rankle	You would think that laziness and failure to show up on time would _____ any employer.	She wondered why being right caused her husband to _____ quickly.	The news would surely _____ him, as he was hoping for a favorable outcome.	His colleague's comments during the presentation were enough to _____ him.
renege	The documentary revealed the truth about how political candidates tend to _____ on their word once elected into office.	Many would want to _____ on their obligations without having any consequences.	Choosing to _____ the obvious choices opened up many more opportunities,	Free will allows us to _____ when necessary when situations are not optimal.
repine	She held back the urge to _____ for a more timely opportunity.	They saw less of each other now since Mary had a tendency to _____ about everything that is around her.	It was a good sign that she no longer had to _____ to her boss about various matters.	Choosing to _____ about a problem usually will have different outcomes than trying to solve it.
requite	He was careful to _____ and perform only good deeds when he had the free time.	He was careful to _____ and perform only good deeds when he had the free time.	It was unclear whether the students were required to _____ their teachers with an original poem.	The manager at the power plant wanted to _____ his employees in ways that would be most useful to them.

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revile	A teacher should be more careful then to_____ her students that way.	His behavior was enough reason to _____ him for his actions.	The parenting class taught new mothers not to _____ their children.	There is no evidence to show that choosing to _____ someone has any benefits.
stultify	Oppressive heat can _____ the mind and spirit, as well as the body.	Her goal was to _____ her friend's efforts so she can earn the promotion instead.	Overwhelming debt seems to _____ most financially and mentally as well.	To win the last debate, she has to _____ her opponent's argument with her own point of view.
titivate	Her need to _____ and clean any room that she stood in was becoming a nuisance to her husband.	The front hallway still remained an eye sore despite my efforts to _____ and paint it.	It seems that the port authority has taken action to _____ its buses for city traveling.	Action was taken to _____ the building in preparation for the new school year.
triturate	The new kitchen appliance was advertised as being able to _____ almost anything.	Today there are quick ways to _____ dry corn in your own kitchen if you want a flour alternative.	The artist was looking for some organic materials he could _____ and use for his new abstract creation.	Some chemicals cannot be dissolved in water unless you can _____ them first to ease the process.
vitiate	They were careful not to _____the quality of service with their long-standing customers after last month's cutbacks.	It is conceivable than an error could be so serious as to _____the entire body of his work	The professor tended to _____ his arguments when he tried to present multiple viewpoints.	Chemicals that are released by many factories do _____ the quality of the air we breathe.
wheedle	The president of the company expects us to _____ him when he visits if we want him to satisfy our requests.	He tried to _____ the surrounding crowd with promises in order to build his public following.	Her ability to _____ was an art form that she perfected over many years of experience.	Mary had experience in teaching women how to _____ and negotiate in work situations.

Table 21. Medium Constraint Sentences

Target Word	Context 1	Context 2	Context 3	Context 4
assiduous	She was a(n) _____ observer during the television commercials because she wanted to go into advertising one day.	Only the most _____ doctors make it through long hours of concentration to successfully complete delicate surgical operations.	The manager wanted to hire _____ employees that would be willing and able to complete even the boring tasks.	The student proved her _____ nature to the teacher by producing a flawless and thorough research paper.
baleful	The weatherman's _____ warnings estimated the hurricane's imminent landfall and predicted terrible damage to the town.	The prophet's _____ vision contained terrible warnings of violence and war to the nation.	The man's _____ smile made her feel afraid when she was alone with him.	She was afraid that fight with her husband had _____ consequences for their future together.
bawdy	Parents criticized the playwright for having _____ material in his puppet show.	He assumed the immature crowd would prefer a little more of a(n) _____ spin on the normally G-rated children's tale.	The student was punished for using _____ language in his formal papers.	The poet's _____ readings scandalized audiences that were expecting a wholesome family outing.
caitiff	The _____ boss left it up to his new interns to fire the nice employees.	Scared of the consequences, the _____ thief pleaded for someone to cover for him.	An anonymous message of insult is a(n) _____way to confront someone.	Only smaller, weaker boys were targeted by the rather _____ bully.

chary	The children were _____ as they approached the busy street before their school.	John was more _____ about giving out personal information than was his younger sister.	Students are advised to be _____ of the consequences involved with drinking alcohol in excess.	The actress became more _____ about eating unhealthy foods after gaining a few pounds.
churlish	The young school girls made _____ remarks to the boys in order to keep them away.	The _____ waitress at the next table did not get a very large tip for her unpleasant behavior.	The teacher's _____ comments during class prevented students from asking questions for fear that she would offend them	The neighborhood was frustrated by the _____ teenagers that played loud music on week nights.
cogent	The respected journalist constructed a _____ argument supporting the study that he felt demonstrated that the risky procedure was a worthwhile option for treating cancer.	The teacher wanted to see opinion essays that were more _____ , so she worked with her students on how to structure a sound argument.	During the debate, the politician provided a(n) _____ outline of his personal strong points which impressed voters and renewed their confidence.	The salesperson had a(n) _____ way of speaking that allowed him to successfully address any customers questions.
desultory	The scatterbrained professor's _____ lecture made it difficult for the class to follow along.	He hated going to the store with his sister because her _____ pattern of shopping made him dizzy.	The student only managed to fill his paper with _____ thoughts on the topic he'd missed.	Children have a(n) _____ way of addressing questions, sometimes discussing everything but the topic at hand.
diffident	The owner of the small business was _____ around the powerful and successful entrepreneurs.	The insecure student had a(n) _____ attitude when approaching the university representatives at the college fair.	The interviewers felt he was too _____ because he had not spoken up during his interview.	Former rejections made the young man _____ when speaking to women at the bar.
doughty	The journalist's _____ camera crew allowed him to capture hard-hitting footage in dangerous situations and remote regions.	The best police officers are _____ men who do what's right in the face of danger.	A commander hopes for _____ soldiers in order to hold out against any odds.	Growing up, little boys often admire the most _____ superheroes who protect innocent civilians.
ebullient	On your first day of work, being _____ and positive can show your manager you are an eager employee.	The newly engaged woman promptly made a(n) _____ phone call to her best friend to tell her the good news.	The teacher's _____ character brightens up the classroom and makes the all children want to learn mathematics.	The school hosted a pep rally to bring a(n) _____ spirit to the campus the day before the big game.
edacious	She realized how _____ her dog was by how frequently she had to buy more food for him.	As she became more depressed, she couldn't help but become _____, too, which in turn caused her to gain weight.	The homeless man was _____ by the time it was his turn in line at the soup kitchen.	She found herself overindulging and could not temper her _____ appetite after running the marathon.

			The _____ professor had worked hard and published many books throughout her career to be recognized as a master in her academic field.	
erudite	This book touches on topics so obscure that even a(n) _____ person would not have seen them before.	One important aspect necessary for a functional democracy is a(n) _____ public that can make informed decisions.		She had a hard time keeping up with the _____ discussion about increasingly lofty ideas.
fractious	Children tend to exhibit _____ behavior when seeking attention from their peers or teachers.	Because pregnant women often become _____, it is best to avoid touchy subjects that may set them off.	The puppy had to be kept locked in a pen when guests visited because she often became _____ toward strangers.	The police had to forcibly restrain the _____ teen they caught causing a disturbance, who continued to resist their efforts.
indubitable	His wedding vows made clear that his love would remain _____ in the face of any obstacles.	The client was confident that his lawyer would present _____ proof of his innocence.	Her rumored interest in running for president was made _____ after her speech announcing her candidacy.	A soldier's loyalty to his country should be _____ no matter what circumstances challenge his allegiance.
inimical	Smoking cigarettes creates _____ conditions for a developing baby in the womb.	Before the 20th century, laws proved _____ to women by forbidding females to vote in elections.	The opposing team's _____ style of play was made painfully clear when they began flagrantly fouling us.	During their fight she used words that were intentionally _____ in order to make her disapproval very clear.
insipid	He thought he would have to eat ____ food because of his recently diagnosed allergies.	After tasting the _____menu at the health foods stand she craved the bold foods of her homeland.	She decided to vary her previously_____ diet so that she would look forward to eating.	To be polite, the boy pretended his mother's _____ dinner was much tastier than it was.
jejune	Noticing that his lecture seemed a bit _____, the professor revised some of his slides.	Her father is easily distracted when she begins her _____ account of her daily events.	The critic accused the ____ movie of failing to capture and hold an audience's attention.	The judges found that _____ contestants stuck in their minds much less throughout the beauty competition .
laputan	The experienced investor scoffed at the _____ and risky ideas of his foolish younger competitors.	Children often imagine _____ plans for their future before they begin to understand the world.	She hoped her air-headed employee wouldn't waste her time because she needed a concrete plan, and she remembered how _____ and farcical his last proposition had been.	Fairy tales often have a _____ quality that makes them appealing to imaginative young children.

lugubrious	Her _____ mood was the result of staining the sweater she had gotten in the store that morning,	An actor wearing prosthetics would have to act especially _____ during a funeral scene for the emotion to come across.	After his long-time girlfriend ended their relationship he was _____ for weeks.	This new tragic play evokes sadness in a simple way, instead of with the overly _____ mood used in traditional tragedies.
mendacious	She often ignores the _____ claims in the tabloids at the supermarket.	When she found out her husband was being _____ she decided to file for a divorce.	Politicians have a reputation for being _____ throughout their career.	Teenagers can be _____ when their parents question them about their whereabouts.
mephitic	The presence of _____ air in some cities makes better waste removal systems necessary.	The scientists working in the animal lab wore masks because they often had to clean up _____ substances.	Some animals use _____ defense mechanisms to disgust any possible predators.	Some areas with flooding have _____ fumes that attract many different kinds of bugs and bacteria.
nugatory	She disciplined her child accordingly, ignoring the _____ accidents and addressing the more important mistakes.	My contribution seemed _____ to the team since I was sitting on the bench the whole game.	The incompetent lawyer provided _____ evidence, neither advancing the case nor hurting it in any way.	She made a _____ attempt to comfort him in his bad mood.
obsequious	The young queen loved the _____ behavior exhibited by even the higher ranks in her kingdom.	His _____ fans sent an abundance of gifts related to his every interest as they fought for his respect.	Kings would often choose to bestow their favors on the most _____ members of their court in order to reward adherence to the dictates of the crown.	The annoyingly _____ student always rushed to cater to his teacher's every whim, earning him the nickname, "teacher's pet."
odious	The shocked audience found the performer's _____ language to be highly offensive and refused to return to the establishment.	The dictator's inhumane decisions gave him a(n) _____ reputation throughout the nation that threatened the longevity of his rule.	The more they listened to the sordid details, the more the jury believed the defendant to be guilty of the _____ crime.	After she broke his trust by exposing his deepest secret, he realized she was an absolutely _____ friend and decided to have no more to do with her.
peremptory	Before letting his daughter go to prom, her father made _____ restrictions on her curfew.	The professor emphasized to the class that his grading was _____ under all circumstances.	After the citizens had deliberated, the town at last held the _____ vote regarding the much-contended issue.	The boy made a(n) _____ decision about where he would play college football by signing a contract.
perfunctory	The sales clerk gave the same _____ smile to every customer as she hustled them into the store.	Often married couples complain that their romantic lives lose their spark and become reduced to _____ acts of affection amidst their	It is clear the doctor is running late because he only stops to offer _____ sympathies to each patient.	The telemarketer gave only _____ responses to my questions as if he was reading from a script.

		busy schedules.		
petulant	The mother did not expect her _____ son to sit through the whole movie without fussing.	The manager fired her _____ employee after he argued with the corporate representative at a board meeting.	The teacher knew naptime was near because the children became more _____ towards one another.	He becomes _____ for hours every time he loses to his sister in a board game.
propitious	He waited for the most _____ moment to propose to his girlfriend during their cruise.	The nice weather was _____ in allowing the family to eat a picnic out in the backyard.	She decided to stay with the company after a(n) _____ meeting with a new client.	The doctor said the baby's first few hours were a(n) _____ beginning despite the mild scare.
punitive	Through his actions he tried directly to get back at her with a _____ intent.	The mother knew she must deal out some _____ response to her daughter's misbehavior, so she grounded her for a week.	Demoting her seemed to be a _____ move to get back at her for seeking a job with a rival company.	The children tended to feel that the difficult homework was_____ in nature rather than a learning exercise.
querulous	Long, boring road trips often lead children to become _____ in the back seat.	The young girl became _____ when her air conditioning broke in the middle of the summer.	He knew when his puppy needed to go to the bathroom because she became _____ and would pester him endlessly until he got the leash.	The restaurant manager finally gave the family a free meal after their persistent _____ comments.
reticent	His persistent charm eventually changed her _____ demeanor and they began enjoying long, entertaining conversations.	Psychiatrists often have a(n) _____ demeanor during consultations that makes it hard for come clients to connect with them.	When certain topics made him uncomfortable he became _____ and would not join in the conversations.	The teacher's goal was to involve the _____ students in the class discussions and activities.
sagacious	The _____ emergency room technicians easily identify high priority cases because of their experience.	The mother taught her son to be _____ when choosing which college to attend.	The _____ woman decided to wear less fashionable, more comfortable shoes because she'd be doing a lot of walking.	She hoped her therapist would be _____ and able to figure out the best course of action.
sonorous	When casting the extremely pompous character's role, the director looked for someone who could give a convincingly _____ delivery of the lines.	Some people remember the more _____ candidates because their speeches are more impressive.	The pompous CEO gave quite a(n) _____ speech detailing his personal successes to the audience at the business conference.	The conceited first violinist's performance was impressive but annoyingly _____ as he played the solo in a frilly manner.

stolid	Even winning the lottery wouldn't affect the _____ expression he puts on in front of people.	They were surprised by his intense passion for the sport, because he remained _____ while playing on the field.	During training, the cadets are taught to be ____ when under pressure in any situation.	Her completely _____ attitude towards socializing made it seem like she didn't care about making new friends.
turbid	After studying for many hours, students feel _____ since they aren't quite sure what time of day it is.	Her grandfather's thoughts were becoming increasingly _____ and she feared that he was losing his memory.	After waking up from a bewildering dream the boy was _____ and couldn't fall back to sleep for a while.	For many children with learning disabilities, new information becomes _____ in their minds and they can have difficulty concentrating.
venial	The teacher described their spelling mistakes as _____ on the test that was more interested in examining reasoning skills.	Bluffing is considered a(n) _____ type of lying that usually happens in the context of a game.	The daughter felt that one fender-bender in the course of a year should be _____ because accidents happen.	His absence was _____ when he provided a doctor's note explaining that he was sick with the flu.
virulent	Some people don't recognize that alcohol can be a(n) _____ substance when used in excess.	People are urged to avoid exposure to anything _____ that could possibly affect their blood.	The doctor said the food was _____ , so the company stopped manufacturing the cheese immediately.	Some animals can cause a(n) ____ injury to their enemies during a fight for food.
voluble	After spending a year living with a poet in France, her French became more _____ and eloquent.	She only knew some of the material, so she wrote an extremely _____ essay to appear knowledgeable without actually saying much about the subject.	Her fear of disapproval disappeared and her confession flowed out in one _____ monologue that surprised her family.	The slightly lonely old man was known for engaging in what ended up being fairly _____ conversations, much to the chagrin of whoever would listen to him.
winsome	The teacher's _____ way of interacting with her students made her lectures more enjoyable.	The celebrity's _____ looks and personality made her beloved by audiences across the country.	She tried to beguile her future mother-in-law with a _____ smile and demeanor at the party.	The old woman had a(n) _____ personality and was well-loved by her many grandchildren.
abeyance	Her obligations as manager would remain on _____ until whenever she returned from maternity leave.	The student put her newspaper subscription in _____ while she studied abroad.	They agreed to put the man's sentence on _____ while he got treatment and counseling.	While her symptoms remained in a state of _____ the doctor encouraged her to take a trip.
acerbity	She criticized the food for its _____, suggesting they change some ingredients for a sweeter taste.	Fresh fruits that are high in _____make unpleasant ingredients for fruit salad desserts.	She questioned the milk's drinkability because of the _____ of its flavor.	The doctor warned him to avoid drinks high in _____ to avoid exacerbating his ulcer.

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alacrity	To make a good impression, the nervous interns worked with _____ on anything that was asked of them.	As kickoff for the Super bowl drew near, the fans finished preparing with _____ for the imminent showdown.	The studious girl approached her difficult classes with _____, as she enjoyed the challenge.	She seemed more motivated than the other candidates because of her _____ to participate in all class activities.
aphorism	For some educational shows, writers infuse a(n)_____ to express lessons to their audiences.	The rabbi always tried to include a(n)_____ in his Sabbath sermon to inspire the local community.	Children are used to hearing a(n) _____ at the end of their stories to solidify the theme.	She expected her wise grandfather to use a(n) _____ to help address her concerns about life.
apotheosis	There are many countries that consider American rights, like freedom of speech, the _____o f natural human rights.	New York models are considered the _____ _ of chic due to the city's elaborate fashion history.	The father strives to exemplify the _____ _ of good moral fiber and judgment to his children.	The pleased movie-goer predicted the much anticipated film would soon be recognized as the _____o f the action movie genre.
asperity	The thinly veiled _____ in the normally respectful student's tone displayed his true feelings towards the unfair teacher.	Though the irritated mother's scoldings were usually full of _____ when she disciplined her oldest, she tried to speak more calmly around the newborn.	The over-protective father's reaction was filled with _____ when he saw the older boy dancing with his daughter.	She flinched with fear at the _____ in the tone of the dissatisfied customers as they complained about her.
calumny	In fraudulent lawsuits about slip-and-fall injuries, accusations are filled with _____ about the environment provided by the defendant.	The unqualified political candidate launched a campaign of _____ about his opponent in order to make himself seem better.	A few police officers created _____ about the chief on an online message board because they wanted to see him fired.	Rival social cliques in high school often spread _____ about each other in order to become the most popular group.
chicanery	Whenever he was asked about suspicious behavior, the crooked cop was good at giving _____ to his chief.	Years of witnessing the _____ of his contemporaries had jaded the southern gentleman into becoming an equally crafty lawyer.	The lobbyist showed that he would stoop to any level of _____ when trying to rally government officials to his cause.	The college student knew the sales pitch was all _____ and would not give into the car salesman.
comity	The ambassador's goal was to advocate _____ among the members of the parliament until a new trading agreement could be reached.	Expressing wishfulness for _____ in one's community starts by abiding by the laws and rules in one's society.	In an effort to achieve _____ between the siblings, they learned to ask first before borrowing each other's toys.	To promote _____, most cities employ a police force and encourage tolerance.

compendium	It would be helpful to compile a _____ of the most important nursing terminology for new nursing students.	A _____ of the company's facts and trends can be found on the homepage of the store's website.	The experienced lawyer wrote a _____ of the most common international law terms and phrases for novices to study.	In the interest of time, the psychology professor chose to assign a_____ of the large number of different theories of personality.
compunction	The soldier was consumed with _____ whenever he remembered that he took a human life during the war.	The alcoholic was motivated to recover by the _____ he had for having stolen from his mother for alcohol.	The passing of her mother left him with a sense of _____ because he insulted her the last time they spoke.	Some people diagnosed with sociopathy seem to have no _____ when hurting others in exchange for their own personal gains.
curmudgeon	The famous movie actor was such a _____ that he scared away most of his fans.	Besides having a bit of a(n) _____ for an uncle, the girl was from a very pleasant family.	The man is such a _____ that his wife was shocked when he apologized for his behavior.	Having a _____ for a boss dampens the mood of the office and makes it difficult to enjoy going to work every morning.
derision	It is condescending and impolite to participate in the _____ of a helpless individual in trouble.	On their first day, new students are usually subjected to _____by the popular crowd in school.	When the boys played a practical joke on their grandmother, their _____ made her feel upset.	People enjoy reading the tabloids because they are full of _____ for the ridiculous antics of many popular celebrities.
dotage	Many people hope that they can avoid _____ by participating in daily activities that exercise the brain and mind.	When the king reaches his _____, it would be wise for the prince to start preparing to take over.	Due to his _____, the long-established radio personality lacked the ability to remember all of the names of songs.	Now in her _____, Mrs. Jones strives for the respect she received for being a great writer in her earlier years.
ersatz	The coach tried to pass off the _____ he purchased as an authentic brand name variety of cleats.	When she's on a budget, she often buys _____ of her favorite foods because they taste similarly but cost less.	Since smoking a true Cuban cigar is illegal in the US, people often smoke a _____ instead of this variety.	Since she bought the purse off of the street she figured it was a(n) _____ and wouldn't last very long.
fecundity	Male species of birds can use feather color to determine the _____ of a potential mother for their chicks.	The beautiful rose bushes in their backyard were the result of the _____ of the soil they used.	Farmers sometimes try to increase the _____ of their chickens and livestock by introducing selective breeding programs.	Doctors will advise against certain medications and supplements if they can potentially decrease _____ for young women.
folderol	During what was supposed to be a serious class discussion, the silly student was scolded for the _____ of his	Comedians sometimes spout _____ between jokes in their routines to draw a few laughs while the audience tries to make sense of them.	The writer was fired from the television show because the utter _____ of his material was disrupting the	The boy was scolded for the intentional _____ of his remarks during the otherwise serious class discussion.

			intellectual tone of the show.	
	comments.			
fruition	His dream was finally coming to _____ after he was promoted to a new leadership position.	The painter was excited that his career would finally achieve _____ once his exhibit opened in the gallery.	She was finally able to experience the _____ of her years of work as she walked up to receive her diploma.	The plan to build the war memorial was finally coming to _____after they had collected enough donations.
hebetude	Some students complain that the length of a school day causes _____ and inhibits active learning.	She didn't find him interesting because his dull conversation indicated the _____ that pervaded all aspects of his life.	After a long day at work, her _____ prevented her from engaging in more athletic activities.	The boy's mother started worrying about his _____ at a young age because most young boys are full of energy.
ignominy	Militaries that prepare especially heavily would suffer the _____ of defeat if they were beaten by a less qualified army during war.	The child had to endure _____ in front of his classmates all the way through middle school for his lisp.	The only way to make up for the _____ of being caught asleep on camera was to work hard the next day.	The professor felt the _____ of being interrupted by a student who knew more than him about the subject matter.
interstice	If it were not for the small _____ of the sink drain, her ring would have fallen into the plumbing below.	She did not need an alarm clock because light from the _____ in the shutters woke her up every morning.	The woman noticed a few _____ in the floorboards of her newly installed wooden floor in the kitchen.	For their own safety, they were instructed to leave the letter in the _____ behind a brick in the building.
invective	His ex-wife's continuous use of a(n)_____ at him, made him lose his hopes for their reconciliation.	The disgruntled citizens made sure that the _____ in the letter was clearly directed at the president.	An adolescent is more likely to spout _____ at an opponent than engage in mature debate.	At the wrestling match, the fan saved the worst _____ he had for his most hated wrestler.
lassitude	The student felt in a state of intellectual _____ from attending five classes every day.	The man roused himself from his _____ after two whole days of catching up on sleep.	The girl was full of _____ after spending a day playing tennis under the hot sun.	The young man was experiencing the general _____ that arises from hard work and lack of sleep.
onus	There is a clear _____ on schools to meet the special needs of children when they are specified.	Being selected as camp counselor would place the _____ with the young girl if the children weren't kept safe.	He gladly accepted the _____ of housing the family heirloom because she had lost it many times.	The new law placed increased _____ on the motorists to disclose medical conditions that could affect their driving.

palaver	When riding the bus, it is often annoying to listen to _____ from surrounding passengers.	The young man joined the attendant in _____ while he waited for his car to be washed.	Some students try to participate in _____ with professors so they can later ask for a letter of recommendation.	The doctor avoided the use of _____ with his patients since he was in a hurry.
paucity	The frustrating _____ of good local restaurants motivated the students to cook in their dorms most of the time.	The boy's aunt asked him to excuse the _____ of her visits while he was in the hospital for surgery.	The man discovered the relative _____ of a specific kind of part, and had to wait to finish fixing his car.	Despite the _____ of updates, most people fled before the flooding spread to the urban areas.
penury	Citizens feared that farms would suffer a period of _____ due to the long-term drought.	A family can often be reduced to _____ by the unexpected death of the main bread-winner.	People in many countries live in _____ throughout their lives despite the advancements made by more developed countries.	Many immigrants come in _____ but work to achieve a more successful lifestyle.
peroration	The forceful _____ that finished off the citizen's long letter of grievances had the most impact on the congressman's vote.	The candidate's _____ left no doubt as to the goals she had been trying to explain throughout the evening.	If not for his climactic _____, everyone would have forgotten the entire message of his argument.	To finish on a powerful note, the petition's _____ bluntly and ominously stated that there was only one correct path.
platitude	The spontaneity of the receptionist's greeting turned into _____ after days of repeating the same welcoming phrase.	Politicians tend to answer questions with some typical little _____ rather than pondering a more unique response.	The acquaintance, not knowing the situation, could offer only an overused _____ which did nothing to console the family about their recent loss.	During the discussion of a well known topic, the student regurgitated a _____ he hoped would impress the teacher.
plaudit	She was mostly remembered for the _____ she received for her great performance.	The new restaurant got a boost from having its specialty dish receive _____ from a national competition.	Her son felt he should receive _____ for cleaning his room without being told.	The class received ____ from their teacher for finishing their assignments on time.
probity	The helpful witness promised to testify with _____ during the murder trial.	The moral leader strove to exhibit _____ as an example to those who looked up to him.	She was raised to value _____ above all other qualities in a person.	He was admired for his _____ despite temptations that had often led others to sell out.
proclivity	The students had a _____ for hanging out at the restaurant down the street.	He developed a _____ for driving in the direction of his home.	Her experience in the military enhanced her _____ to react quickly to any disturbances.	She noticed she had a _____ for looking to her wrist for the time.

solecism	She didn't realize the _____ until after she mailed out her job application.	His social class became evident through his use of _____ terms during their conversation.	The teacher instructed the class not to use any _____ that would detract from the formal tone required for their research papers.	The reader was surprised by the _____ that was left in the publication.
sophistry	Authors often include a character who is adept at _____ in order to thicken the plot and keep the reader engaged.	Many people feel that successful lawyers are just masters of _____ and so are able to win complex cases.	Cult leaders are usually adept at _____ because they are able to generate support for normally questionable causes.	It can be disastrous to trust advice that turns out to be full of _____, especially when the matters concern money.
spate	The new laws have caused a sudden _____ of riots and robberies over the last week.	The movie had a _____ of events that made it difficult to watch at times.	The jury did not expect the _____ of emotion from the witness when he took the stand.	The woman's tears fell out in a _____ upon seeing her long lost daughter and son.
temerity	Surprised at his own _____, the man stabbed the bear that was about to attack his family.	The coach couldn't believe the player had the _____ to head towards the goal despite the oncoming pack of defenders.	She had the _____ to argue about the policy even though she did not know the facts.	The sky diver faced each jump with unbelievable _____, even in light of the unsteadiness of plane.
truculence	When the little boy didn't get what he wanted, his behavior exhibited an unacceptable degree of_____ towards his parents.	The referee will usually penalize a player with a fine for exhibiting too much _____ on the field.	For years, military staff have been infamous for their _____ while dealing with prisoners of war.	A harsher standard of living in the inner city may provoke the _____ displayed by many youth gang members.
turpitude	The utter _____ exhibited by infamous drug traffickers usually spreads throughout the people they are connected with.	An example of complete _____ would be committing a crime against innocent children.	She was sure that the candidate's track record of moral _____ would prevent him from winning another term in office.	He could no longer be trusted due to his history of _____ and lack of ethics.
umbrage	She responded to her own _____ caused by her husband's negative comment by avoiding him for a few days.	The coach's _____ was in response to the suggestions offered from parents that did not know anything about soccer.	She took _____ from the fact that she was excluded from an invitation to a classmate's birthday party.	When he was refused tenure at the university, the esteemed scholar's _____ caused him to say something that got him fired.
vicissitude	In order to call him out on his erraticness, he kept track of each _____ in his opponent's stance on important issues.	The young lady's lifestyle showed such a _____ that her friends felt they hardly knew her.	New research is constantly causing a _____ in the way that doctors treat cancer patients.	Long-term adjustments in behavior or habitat can lead to _____ of a species' genetic makeup.

abjure	As children get older, they often _____ affection from their parents to avoid ridicule from their peers.	The born-again Christian rapper decided to publicly _____ the drug and alcohol use in his earlier lyrics.	When put on trial, the threat of religious persecution forced Galileo to _____ the scientific theory of a heliocentric earth.	The political candidate called a press conference to _____ any former support for the war in response to voter pressure.
abrogate	Animal rights advocates try to _____ regulations that do not favor the animals' welfare and daily care.	The day after they wed, the couple decided to _____ their decision and sought legal help.	The boy asked the principal to _____ the detention slip his math teacher had unfairly given him.	People forced the government to _____ the new laws banning alcohol by not conforming and creating a black market.
abscond	After the incident, the men reluctantly decided to _____ and not share their fortune.	After patiently describing the incident to the guards, he decided to _____ the school grounds with the other witness.	Their plan to _____ was stopped by an alarm that gave them away.	When the babysitter fell asleep, the children decided to _____ with their toys and play outside.
aggrandize	In order to _____ her new fortune, the singer also started a fashion and perfume line.	The inexperienced professional attempted to _____ people's impression of his career by constantly ranting about his resume.	When he invested millions of dollars, he planned to _____ his estate and include a new guest house.	Stage makeup is used to _____ the actors' facial features under the bright theater lights.
ameliorate	The new supervisor implemented changes in health benefits to _____ issues with job satisfaction.	Non-profit organizations based on service are needed to _____ the present human suffering in many poor countries.	Modification to the cross section of the road would _____ the effects of traffic during rush hour.	The new policy was enforced in many states to _____ the strain of the gas shortage.
assuage	People often hope to _____ the consequences of a tragic event by offering aid.	Most people offer an apology to help _____ any animosity that might arise after unwittingly insulting someone.	The fact that I did well in the interview helped to _____ my doubts about getting the job.	He was thankful to have his family around to _____ the grief of losing his wife.
beleaguer	The older boys surrounded the young kids' tree fort and began to _____ them until they vacated it.	A mischievous gang of small boys had recently begun to _____ their neighborhood with a harmless string of petty thefts.	The general ordered a continuous bombardment in order to _____ the enemy incessantly.	She hated the way her mother would _____ her until she included her brother in her activities.
chide	She tried not to _____ her students for missing assignments, and encouraged them to work hard.	She was hired as the supervisor because of her ability to _____ constructively without making the employees upset.	He saw it as his duty to _____ his friends who talked on their cell phones while driving.	Other than to _____ his daughter for not telling him earlier, he did nothing but express happiness for her.

demur	The judge could see no grounds on which to _____ the witness's credible account of the story.	The council did not _____ once the mayor explained that the expense would be covered in the city budget.	The mother of the groom couldn't help but to _____ the idea of his wedding a waitress.	He exercised his right to politely _____ but offered no argument against her perspective.
disport	The mother loved watching her daughters _____ themselves in the backyard after school.	Halloween parties give adults and children an opportunity to disguise themselves and _____ together for one night.	Children have a better ability to _____ themselves with recreational activities than do adults.	The young woman couldn't help but _____ when hanging around her less serious friends.
elucidate	They were hopeful that the results of the research study would help to _____ the perceived relationship between both variables.	The girl asked her father to _____ the complicated instructions so that she could put the desk together.	Students commended the math teacher for her wonderful ability to _____ even the most complex material.	The team asked the presenter many questions in efforts to _____ the mystery.
enervate	The evil witch filled the prince's cup with poison that would _____ him when he tried to face the dragon.	She knew that donating blood would _____ her for the rest of the day so she made sure to prepare ahead.	The energetic young boy sometimes _____ his mother to the point that she has to call someone to come watch him while she rests.	Working at the lumber yard would _____ the young man, so he took a long break at noon.
ensconce	The guests were asked to _____ themselves in the other room while the cook was finishing the dinner preparations.	She preferred to _____herself in a big, soft chair before she started her special meditative breathing exercises.	Once the man proceeded to _____ himself in the driver's seat he felt ready to tackle the long drive ahead.	The actor felt that in order to play the villain, he had to _____ himself in the mindset of a criminal.
exculpate	She knew there was no hope that her mother would _____ her because she had crumbs all over her face.	The judge asked whether the first statements made by the witnesses were sufficient to _____ the defendant.	He was glad to have the necessary documentation to legally _____ him from the charge.	The priest advised her to _____ herself by going to a Sunday mass and confessing.
expiate	The wealthy CEO hoped to _____ his selfish behavior in the past by donating to charity.	His mother gave him one last opportunity to _____ his mistakes by doing chores around the house.	After her parole, she decided to _____ for her former crimes by doing community service in her neighborhood.	She spent extra time in the gym today to _____ for eating a gallon of ice cream by herself.
extirpate	People should be careful not to _____ exotic insect species because their recovery in the wild may not be possible.	The best way to _____ weeds from a beautiful lawn is to pull them out by the root.	Typically, it is not easy to _____ a house of roaches, but they did so in a few days.	Citizens wondered how long it was going to take politicians to finally _____ poverty in their country.

flout	She gave him the silent treatment all day to deliberately _____ his request that they maintain better contact.	The students repeatedly interjected in order to blatantly _____ the new professor's knowledge on the subject.	The lawyer warned his client not to _____ the judge's ruling while still in the courtroom.	The father revoked his daughter's driving privileges to teach her not to _____ his authority.
gabble	After many drinks, he would _____ at random people whether or not they seemed interested in conversation.	Political coaches are hired to ensure that politicians do not _____ unnecessarily while giving campaign speeches.	Her husband would sometimes make fun of her when she would _____ to her friends.	It was a horrible idea to _____ on the phone with the foreign client who does not understand the language well.
gainsay	He was afraid that she would _____ his love by bringing up his infidelity again.	She knew that her brother would try to _____ her claim on the subject because of their opposing views.	She knew it would be selfish to _____ the homeless people's urgent need for food and shelter.	The president was told that if he were to _____ the bad rumors, he would keep his image intact.
indemnify	The company planned to _____ former employees after the sudden closing of the power plant.	They considered changing their policy to _____ individuals for the damages that incurred.	It is only fair that her friend should _____ her for losing the materials she needed for the project.	The judge ordered her to _____ the victims of the car crash because it was her fault.
ingratiate	The new employee tried to _____ his new supervisor by constantly offering to get something for him.	Concerned about the upcoming re-election, the candidate took great steps to _____ the new voters in his district.	His grandparents knew that he only wanted to _____ himself with the family in order to be left in their will.	The bride attempted to _____ her new mother-in-law by complimenting her on the way she was dressed.
Inveigle	With little training, she became skilled in her ability to _____ older men to buy expensive cars.	Even though she hated rollercoasters, her husband could _____ her into getting on a ride with him.	The credit card company was sued for trying to _____ its customers into signing outrageous contracts.	He greeted her with a new piece of jewerly in order to _____ her to forgive him.
maunder	Because her mother was often in a hurry, the young girl was careful not to _____ when she discussed the events of her day.	The police listened to the drunken girl _____ through the details of how the accident happened.	The teacher knew that the essay was Mark's because his thoughts sometimes _____ on difficult topics.	He tried to explain but the pain medications made him _____ the way young children do when trying to tell a story.
obtund	Getting paid to play soccer seemed to _____ the once passionate feelings she had for the game.	The doctors taught her to temporarily_____ her anxiety by blowing measured breaths into a paper bag.	She knows that consuming even a bit of alcohol and driving can _____ her ability to react quickly to circumstances.	The medication was supposed to _____ the pain by releasing endorphins and relaxing her muscles.

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obviate	The driver offered to pay for the repair if it would _____ her from contacting the authorities.	The elementary school teacher had learned early on how to effectively _____ fights between classmates.	He instructed his partner on what to do with the evidence in order to _____ the discovery of their crime.	Because he had studied the procedure, the lab student was able to _____ the dangerous mix of chemicals and instead correctly made the harmless solution.
palliate	Field military clinicians are trained to effectively _____ discomfort due to injury until further treatment is available.	Nothing could _____ the boredom he felt, not even the prospect of a night on the town with his friends.	Students complained that preparing for the exam was stressful and the assigned book did little to _____ the situation.	Doctors explain that the aim of chemotherapy for cancer is to _____ symptoms and improve survival.
palter	During election campaigns some candidates _____ their answers in attempt to hide their political history from disapproving voters.	He was trained to be able to _____ when necessary to gain access to confidential government information.	Sinners are instructed not to _____ the truth when asking for forgiveness from the priest.	She was afraid he would _____ when she asked him about his whereabouts the night before.
pillory	Pro-life supporters like to _____ women who have had abortions in their rallies by using graphic signs.	Many improv comedians like to _____ an unfortunate audience member to show that they can be clever on their feet.	The judge would often _____ the defendant to inappropriately prove his power during the trial proceedings.	The media has an awful way of using magazine articles to _____ celebrities about their personal decisions.
promulgate	He chose to manage his business by example instead of trying to _____ rules for good practices publically.	Many preachers consider it their main duty to _____ the principles of Christianity to the broader community.	The popular media prefers to _____ an overly simplified concept of global poverty to their audiences.	The intern was honored to be selected to _____ the arrival of the distinguished politician at the ceremony.
putrefy	She expected that the salad would _____ if it was left out on the counter.	The bird began to _____ by the sidewalk, causing many flies and bugs to congregate in the area.	As the ripe apples began to _____, the backyard became a less and less welcoming place to play.	A wound on the body will start to _____ if it is not treated in a timely manner.
rankle	Her lack of gratitude began to _____ her father to the point that he stopped giving her an allowance.	Despite his extensive experience with many difficult patients, her abstinence was still able to _____ him when she came to the clinic.	The constant attention her brother received from her parents began to _____her, so she decided to run away.	If her best friend got the promotion, it would _____ her deeply since she had worked harder than her.
renege	Wealthy industrial nations cynically _____ on their promises to tackle global climate change and deforestation for their own personal	The documentary revealed the truth about how political candidates tend to _____ on their word once elected into office.	The realtor was upset that the buyer decided to_____his bid for the house after a long negotiation.	The company shocked everyone by deciding to _____ on a deal that was agreed upon last year.

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	interest.			
repine	They did not _____ about his departure because he had planned this for many years now.	Her company was unbearable so I did not _____ too much when she stopped inviting me to her dinner parties.	Many immigrants after moving to the US started to _____that their living conditions were not as good as in their homelands.	He did not _____ at having lost everything for his children because he wanted to keep them away from their mother.
requite	The nun claimed that she dedicated her work to God to _____ Him for the innumerable mercies bestowed upon her.	The woman felt validated when her law firm finally decided to _____ her hard work by promoting her to partner.	He knew he could not _____ her skillfully cooked meals with flowers alone, so he bought her a necklace, too.	He agreed to let the older woman _____ his offer to mow her lawn with some cold lemonade.
revile	It is a standard policy that school children are suspended from school when they _____ another child for racial reasons.	She was emotionally wounded from when her older stepsister used to _____ her anytime she did something wrong.	The two opposing leaders will no doubt _____each other for their trade policies with other countries during their meeting next week.	The columnist enjoyed his ability to _____ the elite in the city since the article was printed anonymously.
stultify	Seeing her fiancé checking out other women began to _____ her hope that he was actually planning to go through with the wedding.	A public arrest for possession of drugs would _____ her progress at developing a law enforcement career.	The hurricane was going to _____the months they have spent planning their vacation in the Bahamas.	Children are warned that they could ____ their growing minds by watching too much television.
titivate	She wanted to _____ her look before moving to New York, so she went on a shopping spree and colored her hair.	Before she arrived, he made sure to _____ his dreary bathroom with potpourri and clean towels so she could use it.	Her mother usually tries to _____ her clothes for the holidays by adding colorful ribbons to her skirts.	They needed to hire someone to _____ their new office since the building had been built a century ago.
triturate	Much of the world's sand comes from a process where powerful water currents _____ large rocks into sediment.	Some home remedy recipes call for plant roots, however you must _____ them to release their scents and oils.	To make her favorite drink, she needed to _____ the cocoa beans and then put them into the warm milk.	The mother would sometimes _____ the vitamins and mix them into her children's food or drinks without them noticing.
vitiate	The lawyer showed sound evidence to _____ her testimony in order to help his own client win the case.	By his rude actions, it seemed like he wanted to _____ his relationship with his wife.	They were careful not to _____the quality of service with their long-standing customers after last month's cutbacks.	The villain took advantage of every option to _____ the hero's happiness throughout the entire story.

wheedle	She often resorts to flirting with even the grumpiest men at the bar to _____ them into paying for her drinks.	She was upset that she had to _____ her parents into watching her very first college soccer game.	The president of the company expects us to _____ him with compliments if we want him to satisfy our requests.	He knew that she would help him with his calculus homework if he would _____ her with food and treats.

Table 22. High Constraint Sentences

Target Word	Context 1	Context 2	Context 3	Context 4
assiduous	The _____ CEO often stayed at the office to work late into the night.	Entrepreneurs have to be extremely _____ to get a new business off the ground successfully.	Students of law and medicine have to be very _____ or they are sure to fall behind.	The employee made a show of being extremely _____ for the rest of the day to make up for having arrived late.
baleful	Hurricane Katrina was one of the most _____ natural disasters of the last decade.	The villain's _____ smile struck fear in the hearts of millions of audience members.	Young girls' comments about one another can often be incredibly _____.	Some of the world's most _____ snakes live in Australia, making it a potentially dangerous place to visit.
bawdy	The construction workers whistled and made _____ comments to the women walking by.	Many parents feel that late-night entertainment on TV can get much too violent or _____ for innocent young children.	It is considered extremely rude to use _____ language in client meetings.	The woman decided to quit because her boss wouldn't stop making _____ comments to her when he called her into the office.

caitiff	The little boy was so _____ to his friends, it was a wonder he still had any.	It is considered _____ to bully someone smaller than you.	After her friend was _____ to her, she stopped speaking to her entirely.	Crimes against women and children are considered to be some of the most _____ a person can commit.
chary	He was very _____ not to wake his young son as he came home from work.	She was _____ to say yes to a job offer that might require her to travel often for long periods of time.	The elderly couple had been so _____ with their money over the years that they had a very comfortable retirement.	The new reporter was too _____ to do the often dangerous investigation necessary to really get to the bottom of a controversial story.
churlish	The _____ old man would sit on his porch and shake his fist at any drivers speeding down his street.	The _____ waitress at the next table did not get a very large tip for her unpleasant behavior.	Her young son would get extremely _____ when he got hungry.	Though his prissy mother found his girlfriend's sense of humor to be _____, he found it endearing.
cogent	The student's _____ arguments earned him a very high score on the persuasive essay.	The politician's _____ speech was able to swing the opinions of voters away from the new bill proposal.	The student continuously got high scores on papers for his _____ arguments and well-organized thoughts.	The arguments from both sides were so _____ that no one knew what the verdict would be.
desultory	She was going about the project in a completely _____ way, much to the consternation of her more orderly fiance.	His _____ behavior was starting to worry his loved ones, because he usually loved his routines.	Their _____ wanderings landed them in a beautiful clearing in the woods, but they were never able to find it again.	It was a completely _____ chance that brought them together there at that very moment.
diffident	The owner of the small business acted very _____ around the big-time succsessful entrepreneurs he admired.	A few centuries ago it was considered proper for a woman to act _____ around men.	The _____ little boy hid behind his mother when the guests arrived.	Although she was extremely intelligent, her _____ manner in the group interview failed to get her noticed.
doughty	The _____ soldiers ran headlong into the fearsome battle for their country.	Sometimes all it takes is one _____ citizen to stop a thief from getting away.	Firefighters are hailed as some of our most _____ citizens for the work that they do.	The _____ travellers were able to chart a path through the wild, unknown territories for others to follow in their wake.

ebullient	The newly engaged woman immediately gave her best friend a quick, _____ phone call to gush about the great news.	They loved to watch the _____ young colt frolic playfully about his mother in the open field.	The proud mother made a point to show her son that she was _____ about his accomplishments.	The happy couple were absolutely _____ to be expecting a child.
edacious	The salad bar did little to satisfy her _____ hunger after the 24-hour fast.	He was unable to curb his hugely _____ appetite and continued to gain weight.	The mother had a hard time feeding the _____ appetites of her two teenage sons when they would come home from football practice.	She always came home from swim practice _____ because she didn't like to eat beforehand.
erudite	She told her son that it is not just about how _____ you are, but how hard you work in school.	After his first year at college, the young man returned home feeling that he was far more _____ than his younger siblings.	The professionals who are most _____ tend to make the most money in their fields.	The boy's parents advised him that the best colleges not only look for the most _____ students, but the most well-rounded.
fractious	The little girl became _____ when she got tired and hungry in the evenings.	Teenagers are considered the most _____ of age groups, and often seem to be fighting with their parents endlessly.	Being responsible for a pack of tired and _____ 6-year-olds can be one of the most draining occupations available.	The grumpy old man had become more and more _____ towards everyone in recent years.
indubitable	The _____ truth is often terribly difficult to discern from all of the evidence in a court case.	When the _____ facts of the situation were presented to her, it made her choice easy.	The truth of his beliefs was so _____ to him that no one could sway him on any point.	The truth had been so _____ to her in the beginning, but was soon muddled by competing accounts.
inimical	Her _____ attitude towards everyone caused most people to avoid her.	The cleaning product had a large label stating that it was _____ to children.	The _____ parties faced off in the town hall meeting for hours.	Lies and secrets are_____ forces in even the strongest of friendships, and should be avoided.
insipid	He found the native cuisine to be rather _____ and was disappointed.	Because the batter ended up really _____, it didn't hold up when put in the oven.	The worthless broth that the captives were given was _____ and hardly of any nutritional value.	The _____ food packages provided by the weight-loss system was so uninspiring that it only made her crave normal food more.

jejune	She found his stories to be particularly _____ and tended to come dangerously close to falling asleep.	The desert landscape became _____ and uninspiring just outside of Las Vegas.	Unfortunately for the head chef, the food critic found his supposedly zesty specialty to be _____ and unappetizing.	Sometimes the conversations of teenage girls can sound quite _____ to a more mature listener.
laputan	The philosopher's idea of the perfect society was dismissed as being too _____ for today's world.	The young scientist's ideas were considered too _____ to put into practice in his concrete field of applied research.	She was never very helpful because her many _____ ideas always seemed impossible to put to use in the real world.	Her friend was afraid that she her idea of the perfect man was too _____.
lugubrious	The _____ sky didn't create a very fun mood for their day at the beach.	His _____ outlook on life eventually became to much for his more optimistic friends.	Their lonely old house's _____ mood after the death of her husband was too much for the elderly woman.	After his favorite toy broke the little boy remained _____ all day.
mendacious	After two years he discovered that his girlfriend had been _____ with him about leaving her previous boyfriend.	It was clear from the faulty testimony that the witness was being _____ about the events.	The little boy got in a lot of trouble when his parents realized he had been _____ about what he ate for lunch every day at school.	Though con artists can seem friendly or sincere, they make their money by being _____ with the customers that trust them.
mephitic	City dwellers hate having to walk by _____ dumpsters on the sides of the street.	There are certain types of cheeses that many people find to be quite _____ to the nose.	The _____ fumes from the science experiment filled the lab with their odor.	Though sulfur springs can be therapeutic, many people find their odor to be so _____ that they can't stand to be around them long.
nugatory	Though he knew his efforts were _____, he felt he had to try.	She would get so upset over the most _____ things that eventually her friends stopped b to help her.	The evidence provided by the incompetent lawyer was completely _____ to the case and got them nowhere.	The article ended up being full of _____ information that didn't help the student at all with her paper.
obsequious	She was such a(n) _____ girl, her parents were afraid she wouldn't know how to stick up for herself in a relationship.	She was so _____ towards her boyfriend that her friends decided to tell her to start sticking up for herself.	The king chose the most _____ of his subjects to be his personal help, because he knew they would do whatever he desired.	The intern put up with being _____ towards his superiors, hoping that he would climb the ranks quickly and eventually order his own staff around.

odious	The courtroom was appalled at the recounting of the man's _____ crimes.	The _____ villain of the movie frightened disturbed many an audience member.	Her culinary concoction was positively _____ despite her best efforts.	He knew he would never forget the _____ images of war he had seen on the news that day.
peremptory	Children don't like their peers to be to _____ and tell them what to do.	The _____ decision would be made by the executive board.	It is _____ that a lifeguard know how to swim and administer CPR.	The king wielded a(n) _____ authority over all his court and country.
perfunctory	The girl's manager fired her for being so _____ about her job as to repeatedly make the same mistakes.	Saying, "You're welcome" is an _____ response to "Thank you" for most native English speakers.	After playing so many video games, many teens have become completely _____ to the violence portrayed on TV.	Putting a hand up to shade one's eyes is a(n) _____ reaction to stepping out into the sun.
petulant	It can be hard for parents not to lose their tempers and become _____ with their young children hitting the "Terrible Twos."	Pregnant women are stereotypically thought of as being quick to get _____ with their beleaguered husbands.	The older man's seemingly _____ disposition was just a cover for a kind heart.	The little boys' parents knew he was likely to become _____ if he didn't have something to eat and take a nap soon.
propitious	The players took the nice weather to be a(n) _____ sign for their game that day.	Her _____ words built up the confidence of the young children.	The young executive hoped all his hard work would meet with a(n) _____ response.	With premature babies, getting them to breathe on their own is considered a _____ start.
punitive	The principal felt it was her duty to determine an appropriately _____ action against the group of students that had broken the rules.	Gang members often display _____ tendencies that prompt them to get back at anyone who had done something against one of their own.	Many feuds start because hostile family members continue taking _____ actions against one another to repay past offenses.	The teacher assigned some additional work load to the students as a _____ measure for their bad behavior in class.
querulous	The nurses found the _____ old man to be particularly obnoxious that day.	Stubborn teenagers become quite _____ when their parents ask them to do household chores.	He couldn't look forward to his mother-in-law's visits because she was always so _____ , no matter how pleasant he was to her first.	The parents knew their tired young son would become very _____ if he didn't get his favorite ice cream flavor.

reticent	When drunk, he was hardly _____ about speaking his mind, and he wished he had kept his mouth shut the next day.	They noticed she had been really _____ lately, and because of her usual vivaciousness they grew worried.	They thought she wasn't having any fun but it turned out she was just a more _____ person in general.	Though she had a fiery personality off camera, she came off rather _____ during the televised interview.
sagacious	His _____ old grandfather always seemed to have the best advice even in the toughest situations.	Her _____ comments won her the recognition of the professor in the upper-level class.	The man's friends all felt he had come to a good and _____ decision by accepting the well-paying position.	They decided it was _____ not to continue the game in the thunderstorm.
sonorous	Many viewers are turned off by politicians who use lots of _____ language and seem to feel superior to the voters.	The authors of the 19th century were known for using _____ language that seems rather showy to readers today.	The politician's _____ orations made him seem conceited and unable to connect with the common voters.	Though her boyfriend loved the loud orchestral piece, she found it to be unnecessarily _____ and show-offy.
stolid	The old donkey was incredibly _____ and always refused to be moved.	ER doctors have to remain _____ in the face of awful injuries in order to do their jobs effectively.	The hard-bitten general could remain _____ even in the most exciting of situations.	The sociopath's inability to feel emotions caused her to display a(n) _____ attitude in the face of being accused of murder.
turbid	The conversation left him feeling even more _____ instead of answering his questions.	She became _____ about what to do when she got conflicting information from two different sources.	She was still a bit _____ by the material, so she didn't raise her hand to answer the question.	His vision became _____ as he neared unconsciousness.
venial	The _____ mannered young man was hard to make angry.	Because the girl was sick, the teacher decided her absence was _____.	Her boss told her that grumpiness towards customers was not _____ even if she had been up all night studying.	The teacher assured his student that missing one day of class would only be a _____ problem.
virulent	Australia is home to some of the worlds most _____ snakes and spiders.	People are urged to avoid exposure to anything _____ enough to possibly affect their blood.	Her _____ words stung him deeply and he left the room.	The rumor she started was so _____ that it ended even their strong friendship.

		The man was very _____ to the point that he could completely monopolize a conversation for hours at parties.	Though _____, the student's term paper really didn't say anything of substance.	The older man was known for engaging in _____ conversations with anyone willing listen to him.
voluble	She was thrilled to come back _____ in a second language after a semester abroad.			
winsome	The _____ young woman made quite an impression on the young men at the party.	Sometimes it can be very difficult to be _____ when you're having a bad day.	Despite her low expectations, she found her blind date to be quite _____ and they made plans to see each other again.	She hoped to come across as _____ and enjoyable when she met her boyfriend's parents.
abeyance	The cell phone company sent a notification that the inactivity of the girl's account would cause it's temporary _____ if it remained unused.	The lawyer asked the judge for a _____ as they deliberated some of the finer points of the case.	The employee couldn't wait for the _____ from work that lunch time always afforded him.	The _____ of a play is a good time to get up and stretch one's legs.
acerbity	The _____ in her speech was too much to handle , her therapist recommended that she stop using harsh words.	The _____ of his biting sense of humor often came across as more mean-spirited than funny.	The food critic felt that the _____ of the lemon contrasted nicely with the sweetness of the candied nuts.	The deep _____ he felt towards all mankind eventually resulted in his becoming a hermit.
alacrity	The energy she brought to the office everyday made her _____ for her job apparent to all who worked with her.	The _____ of the huge crowd at the revival meeting was astonishing to behold.	The team's hometown was alive with _____ on the day of the state championship.	She seemed more motivated than the other candidates because of her _____ to participate in all class activities.
aphorism	The shockingly-worded _____ on the group's banners was meant to catch people's eyes so that they would want learn more.	Many fables end with a _____ that is meant to help readers through life.	The optimistic words of the candidate's _____ written on his campaign posters caused many to associate him with hope and change.	The religious text was full of short _____ meant to help believers understand the teachings.
apotheosis	The hymns were meant for the _____ of God through music.	The media's _____ of professional athletes as perfect specimens of manhood has proliferated much of our culture.	His swift _____ to the highest position of power was due to both his charisma and his shrewd intelligence.	The fervor of public _____ for her brave deeds insured that she would be remembered for years to come.

asperity	Her demeanor would become full of _____ when she was tired and hungry before dinner.	His _____ when he got tired and hungry was almost too much for his mother's patience.	She turned on him with such unexpected _____ that he felt as if he were under attack.	The _____ he demonstrated in his dealings with her became emotionally unbearable until she finally asked for a divorce.
calumny	The tabloids spread _____ about the young actress after her comments against the paparazzi.	The trouble-making employee liked to spread _____ about her coworkers.	He knew that if the story got out he would get mired in _____ and his career would be over.	The _____ that the high-profile couple were spreading about each other reached the papers the next morning.
chicanery	The sleezy car salesman's underhanded _____ successfully got the woman to buy the clunker of a car.	By the end of high school her tendency for _____ had caused many of her former friends not to trust her.	He soon realized that his friends' invitation to dinner was just a _____ to get him out of the house before the surprise party.	The lieutenant was promoted for his brilliant _____ that had successfully caught the enemy off guard.
comity	Sometimes the prospect of the whole world living in _____ seems like an impossible dream.	The ecologist was shocked that the two prides of lions seemed to be living in relative _____ together in the valley.	He was praised for managing to establish _____ between the many feuding factions.	She told her kids that if they couldn't manage to keep the _____ with each other they would not go to the movie that afternoon.
compendium	Professors usually provide their students with a(n) _____ for the class at the beginning of the term.	The new boss compiled a(n) _____ of the immediate changes she would be making.	It is often much easier to read a(n) _____ of highly technical research articles.	They began every morning by going over a(n) _____ of the scheduled events for that day.
compunction	Her _____ for the things she had said to her best friend ate at her all day.	Even though his feelings of _____ over breaking up with her told him it was wrong, he couldn't keep himself from calling her.	Some people diagnosed with sociopathy feel no _____ when hurting others in exchange for their own personal gains.	The alcoholic was motivated to recover by the _____ he had for having stolen from his mother for alcohol.
curmudgeon	The old man had become a complete _____ in recent years, to the point that the neighborhood children thought it best to avoid him.	She was awful to take on trips because she always became a(n) _____ and put a damper on everyone's mood.	No one liked working with the little boy because he was always a(n) _____ about having to do the slightest part of the work.	The little boy's parents told him that if he didn't stop being a(n) _____ and cheer up they would take him home.

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derision	He claimed he had only meant his comment as a(n) _____, not to be offensive.	Her obvious _____ for the book was enough to discourage the editor from publishing it.	The unfortunate boy became the _____ of the party after he tripped and fell flat on his face.	He grew very frustrated and bitter with the _____ in his wife's attitude toward his work.
dotage	The _____ that begins to ail people at the end of their lives often requires their families to place them in retirement homes.	The elderly couple became increasingly confusing to speak to as their _____ advanced.	The _____ of his faculties that came with advancing age made it increasingly difficult for him to function on his own.	The grandfather's _____ and poor health made it difficult for him to visit his grandchildren very often.
ersatz	Her _____ accent didn't fool anyone into thinking she was from Russia.	There are some incredible stories about what people have gotten away with by writing _____ checks and cashing them.	The _____ Gucci purse only cost her thirty dollars, whereas the real thing would have cost three hundred.	Though the salesman tried to pass the item off as the Real McCoy, the customers new it was a(n) _____ and refused to pay his price.
fecundity	The _____ of farm fields is enhanced by rotating different crops.	The new business manager was glad to see his employees' increase in _____ resulting from his new deadline policies.	Adding compost to a garden can greatly improve the _____ of the soil.	The gardener was astounded at the _____ of the soil.
folderol	The advanced calculus textbook looked like a whole lot of _____ to many of the students' eyes.	The sheer _____ of the idea was enough to make the entire committee laugh.	Most people consider stories of UFO sittings to be total _____, like the majority of the sensational tabloid reports.	The utter _____ of the plan was enough to almost laughable.
fruition	He could finally see all of his hard work coming to _____ as college graduation neared.	It seemed that she met with great _____ in everything she attempted.	The team knew they had to see the project through to _____, no matter how long it took.	The down-to-earth executive always said that his greatest _____ was his three children.
hebetude	The intense heat wave kept them inside in a state of _____ in front of the fan.	He had trouble rousing his team from their _____ brought on by the heat that day.	Her extreme _____ after playing in three games that day caused her to call it an early night.	The dog laid around all day in a state of _____ while medicated after the surgery.

ignominy	The banished man left his city in _____ after losing all his property.	The _____ that the girl's actions had brought upon her family caused them to disown her.	She hung her head in _____ while the principal berated her for her actions.	The actions of their youngest son brought _____ to his family.
interstice	The _____ in the wall was only big enough for them to fit through if they walked sideways.	If it were not for the _____ in the grate on the street, her ring wouldn't have fallen into the piping below.	For their own safety, they were instructed to leave the secret letter in the _____ between the two bricks in the building.	The woman complained about the _____ between some of the boards in her newly installed wooden floor in the kitchen.
invective	His wife unleashed a(n) _____ at him for not picking up their son from daycare.	She considered what he had called her to be a(n) _____ and refused to speak to him until he apologized.	The little girl placed all of the _____ for the mess on her younger brothers.	Her tone was dripping with _____ as she spoke to her evil mother-in-law.
lassitude	The woman's extreme _____ continuously exasperated employer's looking for high levels of efficiency.	His _____ after a long day in the blazing sun left him unable to stay up late for his favorite show.	The sudden _____ of the usually energetic boy had his parents worried about his health.	She believed her complete _____ was due to the increased hours she was working at her job.
onus	Being selected as camp counselor placed the _____ on the teenager to keep the children safe.	He gladly accepted the _____ of keeping the family heirloom safe because she had lost it many times.	The new law put the _____ on motorists to disclose medical conditions that could affect their driving.	The player's hurt knee caused him to be a(n) _____ to his team.
palaver	The young man engaged in pleasant _____ with the attendant while he waited for his car to be washed.	When riding the bus, it is often annoying to listen to _____ from surrounding passengers.	The executives attended the important _____ on "greener" means of production.	The professor tried to turn her lecture into more of a(n) _____ to encourage students' input.
paucity	The growing _____ of many of the world's most precious resources is becoming an ever-increasing cause for concern.	Despite the _____ of updates, most people fled before the flooding spread to the urban areas.	Due to a _____ of tools, he had to hire a repairman to fix the broken pipes.	The detective's _____ of information was a serious weak point in the case.

penury	The _____ and hunger within developing third world countries remains a serious humanitarian issue.	The _____ for available water prompted the Romans to create their systems of aqueducts.	Many medieval monks took vows of _____ in order to better serve the people.	A family can often be reduced to _____ by the unexpected death of the main bread-winner.
peroration	He added his congratulations almost as a(n) _____, so it didn't seem very sincere.	As his speech neared its climactic _____, the audience surged to their feet in applause.	The _____ that the author added at the end of the book wrapped up any of the loose ends in a satisfactory way.	They were all excited to finally reach their _____ after days of travelling.
platitude	The advice he gave her was nothing but a(n) _____ that everyone had heard a million times.	He made his point by recounting the old _____ about the tortoise and the hair.	The complete _____ of the speaker's voice put everyone to sleep within minutes.	There is an old _____ stating that "slow and steady wins the race."
plaudit	She was mostly remembered for the _____ she received for her great performance.	The audience gave the band a standing _____ at the end of the show.	The author's new book met with high _____ in the literary media.	He paid her a(n) _____ in the hopes that she would agree to go to dinner with him.
probity	Anyone in a position of leadership should strive to demonstrate _____ to those who look to their example.	The witnesses' _____ was obvious to the jury, who fully believed their testimony.	He had fully demonstrated his _____ to his parents, and they began giving him more freedom.	Her complete lack of _____ made her an awful role model to young children.
proclivity	He had a definite _____ for practical joking that could become too much for his family.	She did not have a(n) _____ for compromising, which could make things difficult between her and her roommates.	A(n) _____ toward sympathy is an important quality for someone in a counseling position.	She had an unfortunate _____ for eating when she got nervous.
solecism	Many people point to texting as the cause of the _____ so many adolescents make in their writing.	He asked his friend to proofread his paper to check for _____ before he handed it in.	There was a glaring _____ between the two versions of the story.	It is easy to make a(n) _____ when trying ot use the slang of another language.

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sophistry	Magicians are highly trained in the art of _____ to convince their audiences.	The con artist's speech was full of _____ as he reeled in his next customer.	The speeches of lawyers and politicians are known for being full of _____.	The _____ of the two witnesses' stories convinced the jury that something was amiss.
spate	The _____ of emails following the TV advertisement crashed the system.	A(n) _____ of strong leaders in a row allowed the budding nation to take firm root.	He finally snapped and let loose a _____ of insults and profanities.	The _____ of water sent crashing through the gully after the rainstorm caused much damage to their campsite.
temerity	The _____ manner in which he spent his inheritance caused his father not to trust him to carry on the family business.	She was surprised that her little brother had the _____ to tattle on her to their parents.	The teacher was infuriated at the _____ of the student who presumed to tell him he was wrong.	The _____ that her friend displayed by butting in on their date surprised and angered her.
truculence	The attempts at peace made by one side of the conflict were promptly met with open _____, and the battle was on.	He was disheartened to meet with a great deal of _____ in the first meeting of the company he had forcibly taken over.	The _____ that existed between the two feuding parties was making it very difficult to keep the peace.	The increased _____ between the two countries in the midst of a cold war caused a great deal of tension and fear.
turpitude	The utter _____ of the brutal crimes was sure to earn the man a life sentence.	The dichotomy of good and _____ is a thematic staple in the realm of literature and film.	The young children were shocked by the utter _____ of the villain's actions in the movie.	The number of politicians who become involved in _____ has disillusioned many voters.
umbrage	Her _____ caused by her friend's rude tone of voice caused her to snap back at her in kind.	He took _____ at the way he had been portrayed in the newspaper article.	As the day wore on she had more and more trouble hiding her _____ at the frustrating people around her.	He had still not completed the paper even after an extension, much to the _____ of his professor.
vicissitude	The constant _____ of the stock market makes many people wary of investing too much money.	Meteorologists attempt to predict any _____ of the weather for the public knowledge.	New research is constantly causing a(n) _____ in the way that doctors treat cancer patients.	The young lady had made such a(n) _____ in her lifestyle that it became impossible to predict her appearance.

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abjure	Religious persecution forced many people to _____ any beliefs that didn't fit with the church in the Middle Ages, in favor of more orthodox ones.	The car company had to _____ an entire line because a defect was discovered.	Soldiers are not allowed to _____ their companies during a time of war.	After recent events, they thought it best to publicly _____ having any connection with the cult-like organization.
abrogate	When the TV station decided to _____ the show, they were inundated by letters from angry fans.	She had to _____ the check she wrote because she had made it out to the wrong person.	Abraham Lincoln is credited as the first president to _____ slavery in the United States.	The publicist decided to formally _____ the false accusations of infidelity made against her client.
abscond	Once they stole the diamond, they tried to _____ through the back door but were stopped by an alarm.	The suspects were forced to _____ without telling their loved ones where they went.	The inmates made an intricate plan to _____ in two months while they pretended to play poker.	He planned to drop off the hostage and then _____ with the ransom money and travel into Mexico.
aggrandize	The young lawyer did everything she could to _____ her standing in the eyes of the partners, hoping one day to be among them.	When he invested millions of dollars, his desire was to _____ his estate to include a guest house.	The bold and righteous king's actions were able to _____ his family's influence and prestige.	He hoped his accomplishments would _____ his standing against the other competitors for the prize.
ameliorate	Her friend offered to help _____ the load of work she had to do by watching her kids.	He could not have been more grateful when his coworker came in to _____ him of his duties for the day.	The politician worked quickly in order to _____ the odds that a peaceful resolution to the conflict could be reached.	The organization was recognized for its efforts to _____ the quality of education in inner city schools.
assuage	They decided to _____ the load by leaving all the food behind.	The man was consumed with the desire to _____ his thirst after seven days out in the desert.	He hoped the fond memories would _____ the pain of their goodbye.	She tried to _____ the fears of her young son when he came running into her room in the middle of the night.
beleaguer	The little boy loved to _____ his older sister when her friends were around.	The biting bugs began to _____ the campers as soon as the sun went down.	In medieval warfare, an army would often _____ an enemy stronghold for days on end.	If he didn't triple check that the stove was off when he left, it would _____ him for hours.

chide	The little boy couldn't stand it when his older sister would _____ him for being naughty, as if she were his parent.	The worker's boss called him into his office in order to _____ him on his poor customer service.	The teacher would _____ her students for not washing their hands after playing outside during recess.	The children felt like all their grandmother ever did was _____ them for being rowdy.
demur	She had to _____ the temptation to buy the shoes immediately.	He would always _____ when it came to the moment of actually making a big decision.	He would always _____ before making a big decision.	The voters determined to _____ the unfavorable bill until the very end with petitions and demonstrations.
disport	The mother loved watching her daughters _____ out in the backyard.	While her brother preferred to _____ outside, the girl preferred to read in the big armchair.	The babysitter was surprised at how well the little boy was able to _____ himself without her having to come up with something to do.	The mother loved that her children enjoyed going out to _____ in the park across the street.
elucidate	She decided to go to her professor's office hours so he could _____ some of the more confusing lecture material for her.	Rather than describe how to swing a bat, the coach decided to _____ the motion instead.	He found that the figures in the textbook were the most helpful ways to _____ the complicated information to his students.	The boss called a meeting in order to _____ some confusing points in the memo he had sent around earlier.
enervate	The venom of some spiders can completely _____ their insect victims.	He dreaded the long walk home that would always _____ him after a hard day at work.	There are rules protecting football quarterbacks because there is such a high risk that neck injuries could _____ them.	Years of termite problems were able to _____ the structure of the building's foundations until finally it collapsed.
ensconce	He got to the library early in order to _____ himself in one of the comfortable chairs to study for finals.	She loved to _____ in the big cozy armchair and read a book on rainy days.	The thieves decided to _____ their loot under a specific tree.	He had to _____ the gift he bought his fiancée behind some empty boxes.
exculpate	The defense attorney urged the jury to _____ her client of all charges.	They were afraid to _____ their new dog from his pen in case he chewed up the furniture.	He knew he could not _____ their actions, but he found it hard to fault them.	Effective immediately, the company would _____ the former employee of all responsibility.

expiate	He knew it would be almost impossible to _____ himself in her eyes after he cheated.	The man tried to _____ for his horrible job as a father by being as involved as he could with his grandchildren.	One of the hardest things to do is _____ someone who has hurt you.	His mother gave him one last opportunity to _____ his mistakes by doing chores around the house.
extirpate	The experienced criminals knew how to completely _____ the evidence of their presence at a crime scene.	It seems that every few years there is a new flu virus reported to be able to _____ entire populations.	The city council would vote the next night on whether to _____ the old eye-sore of a building from the city center.	Many homeowners wish there were one product that would _____ all sorts of pests.
flout	The way the boy would completely _____ the authority of his babysitter aggravated his busy parents.	Whenever she was asked to do her chores she would just _____ her mother and continue doing whatever she wanted.	The boss could not allow the employee to continue to _____ him in front of the others the way he had been.	The judge refused to allow the woman on trial to so rudely _____ his judicial authority in the courtroom.
gabble	After many drinks, he began to _____ to random people that seemed completely uninterested in the conversation.	Her husband made fun of her when she would _____ to her friends about silly girly things.	The amount of people who spread _____ throughout a typical high school can make it hard to know what to believe.	Sometimes it was easier to just let the girl _____ on about whatever came to mind rather than try to participate in the conversation.
gainsay	The athlete attempted to _____ any involvement in the plan to cheat on exams.	It can be difficult to _____ the temptation to eat when you're bored.	The two rival fencers were glad for the opportunity to formally _____ each other in the competition.	The executive wished to _____ all the claims that he had been aware of his employees' underhanded dealings.
indemnify	They will be forced to fully _____ the organization for any consequences incurred by their breach of the contract.	The insurance companies often charge exorbitant rates to protect against the possibility of having to _____ any clients who fall ill or get injured.	The guy asked that the girl _____ him by fixing his car's damages from the crash.	He knew that once he got paid he would have to _____ his parents for covering his first month's rent.
ingratiate	The magician was able to _____ his audience with his mesmerizing tricks.	She was quickly able to _____ him with her sweet smile and good looks.	She never found it difficult to _____ the men around her with her bright coy smile.	He was always able to _____ the parents of his various girlfriends with his ready smile and sense of humor.

Inveigle	The salesperson was skilled in her ability to _____ older men to buy expensive cars.	The men tried everything they could think of to _____ the zoo animal back into its cage.	Try as she might, she could not _____ the dealer to sell her the old car to her at a discounted price.	His dashing smile and courteous manners made it easy for him to _____ her into going to dinner with him.
maunder	They just let her _____ on and on about whatever came to mind at the party.	As they left the room they heard him _____ something under his breath.	For the first year or so of life, babies can only _____, not talk.	Whenever the student sat by a window his mind would _____
obtund	Years of use will usually _____ the point of a tool.	He agreed to take anesthesia to _____ the pain of his surgery.	They used the shade to _____ the harsh light of the lamp.	They hoped the large dose of pills they gave him would be enough to _____ the pain of the procedure.
obviate	The boss reasoned that firing him now would _____ the necessity of firing him later.	In order to _____ further damage, they avoided using that door until someone could come look at it.	She decided to have a C-section in order to _____ the risk of complications during a natural childbirth.	Some drugs _____ the uptake of certain chemicals when there is too much of them in the brain or bloodstream.
palliate	He hoped to _____ his daughter's fears by giving her a night-light in her room.	Many species have special markings with which they _____ themselves against the scenery.	She took a long, hot shower to _____ the stress of the work day.	Though many drugs have the helpful ability to _____ pain, they can also become addictive.
palter	Though the salesperson was willing to _____ over the price of the item, they weren't able to agree.	They knew their son would _____ about where he was going if they didn't threaten to take the car away.	The boy was punished for his tendency to _____ when he confessed to the priest.	The cagey customers knew how to _____ with the spice merchants at the market.
pillory	The arrogant young musical prodigy had the nerve to publicly _____ his former master for her lack of talent or creativity.	Few things are quite so detestable as parents who _____ their children.	The boss knew she had to _____ her assistant harshly for his mistake in order to set high standards for other employees.	It is always easier to _____ the actions of others than to come up with satisfactory solutions yourself.

promulgate	It is a publicist's job to _____ his or her clients as much as possible.	Because they were not able to _____ much before the premiere, the movie did not make much money in its first weekend.	They acted quickly because they knew the rumor would _____ all around the school by the end of the day.	The press secretary was fired when he failed to _____ the public of the final decision.
putrefy	Highly perishable food is typically expected to _____ after a certain amount of time.	The milk left out on the counter had begun to _____ when he got home.	By the time the detectives found the body it had already begun to _____ in the water.	The frescoed cieling had been allowed to _____ for years before any work at restoration was done.
rankle	His wife's comments about his job had really begun to _____ him.	Her little brother delighted in continuously trying to _____ her while her friends were over.	After a trying day at work it was hard not to let the obnoxious drivers on the highway _____ her.	The kitten was always trying to _____ the older cat, who grew tired of having his naps interrupted.
renege	Most people consider it a significant breach of trust to _____ on your promises.	The doctor's office had to officially _____ its support of a certain type of insurance carrier.	After the candidates actions were brought to light, the company decided to _____ their support from him.	The young prince decided to _____ his hereditary claim to the throne, giving it instead to his uncle.
repine	The little boy would often _____ that his brother got more toys than he did.	In times of war, countless families are left to _____ the loss of homes and loved ones.	They could hear the little puppy begin to _____ as they left him alone in the house for the first time.	The boss knew that employees would start to _____ around the office if they didn't receive their Christmas bonuses this year.
requite	He tried hard to _____ himself in her eyes after forgetting their anniversary.	They expected the bank to _____ them for the mistaken charges.	It was hard for the politician not to _____ in kind to the slander printed about him in the media.	After her friend spotted her some cash, she promised she would _____ next time they went out to lunch.
revile	As soon as she saw the mess in the kitchen she knew she would have to _____ her son sternly so that it wouldn't happen again.	The opposing candidate thought someone should have the guts to _____ the corrupt politician for his actions.	The teacher made a point to _____ any students she found guilty of cheating in order to dissuade others from doing the same.	The coach made sure to _____ his player for not being a better role model on the court.

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stultify	It is generally accepted that drugs and alcohol can significantly _____ one's judgment.	Though the lawyer tried to introduce obstacles that would _____ the process of the trial, the judge wouldn't allow any more postponements.	The young man felt that continuing in his dead-end job would _____ his plans to get out and make something of himself.	They feared that the completely unstimulating classroom environment would _____ the students' ability to learn.
titivate	Many families have a tradition to _____ the Christmas tree.	He went home to _____ himself up before the fancy office dinner party.	She wasn't sure what the most appropriate way to _____ for her date at the symphony would be.	She informed him that they would not be leaving the house until he agreed to _____ himself up for the fancy restaurant.
triturate	Women centuries ago would have to _____ corn into powder in order to make flour.	His tendency to _____ on the door at all hours of the night when he came home was starting to bother her.	The ocean waves are eventually able to _____ even the toughest rocks into fine sand.	The first mills used water wheels to _____ corn or other products into meal.
vitiate	The pair were quick to _____ their marriage from the night before in Vegas.	He knew his parents would _____ his driving privileges if he didn't find a job to pay for his own gas.	The suspect wanted to _____ his confession as soon as he talked to his lawyer, claiming he had been unfairly intimidated.	The president promised to _____ the unpopular tax during his term.
wheedle	She was rarely able to _____ him into going to the ballet with her.	They put out some food to _____ the mouse into the trap.	The girl hoped she would be able to _____ her parents to allow her go to the concert with her friends.	He was able to _____ her not to quit the job by telling her they couldn't do without her.

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