English word recognition and word integration skills of native Arabic- and Japanese-speaking learners of English as a second language

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ABSTRACT
This study investigated the effects of first language word-level reading skills on the development of English as a second language (ESL) word-level reading skills. A crosslinguistic analysis indicates that native Arabic and Japanese speakers are likely to encounter different types of ESL word-level reading difficulties. Specifically, native Arab speakers are likely to exhibit difficulties with prelexical ESL word recognition processes, whereas native Japanese speakers are likely to exhibit difficulties with on-line ESL word integration processes that integrate words into phrase/clause structures for comprehension. Results from a lexical decision task showed that a group of Japanese ESL learners had significantly faster and more accurate word recognition skills compared to a proficiency-matched Arab ESL group. In contrast, both groups read words within sentences in a sentence reading task at the same speed, though the Arab ESL group was significantly more accurate in integrating words into larger phrase and clause units and comprehending them than the Japanese ESL group. These results indicate that Arab and Japanese ESL students have different word-level reading difficulties, implicating different learning needs and pedagogical interventions for developing ESL reading proficiency.

Reading research has firmly established the importance and prevalence of word-level processing skills involved in fluent reading or text processing (Just & Carpenter, 1980; Perfetti, 1985; Rayner & Pollatsek, 1989). An extensive amount of first language (L1) research clearly shows that word recognition and word integration (i.e., integrating words into larger units of meaning at the phrase and clause level) processes are the most widely used of the cognitive and linguistic processes involved in text processing (Gibson, 1998; Rayner & Sereno, 1994). Similarly, research with relatively proficient second language/English as a second language (L2/ESL) speakers also indicates that word-level processing skills involving word recognition and word integration are the most widely used cognitive and linguistic processes involved in L2/ESL reading and
text processing (Frenck–Mestre & Pynte, 1997; Hoover & Dwivedi, 1998; Juffs & Harrington, 1996; Koda, 1996, 1998). However, there are some important differences between the development of L1 word-level processing skills and the development of L2/ESL word-level processing skills, particularly for those acquiring L2/ESL literacy skills during adolescence and later. In fact, the research evidence suggests that L1 word-level processing skills appear to be a significant factor that interacts with and shapes the development of L2/ESL word-level processing skills (Akamatsu, 1999; Juffs, 1998a; Koda, 1998, 2000). Thus, ESL learners from typologically different L1 backgrounds may have distinctly different problems and consequently different needs in developing fluent word-level ESL text processing skills.

The primary goal of the current study was to obtain evidence of such cross-linguistic variation in the development of ESL word-level processing skills, which are essential for developing ESL reading and text processing fluency. In particular, I examine how the L1 word-level processing skills of native Arabic- and Japanese-speaking ESL learners potentially shapes the development of their corresponding word-level ESL processing skills in distinctly different ways. The sections that follow briefly address some of the research implicating the importance and nature of word-level processing skills in L1 and L2/ESL reading. Then I discuss how L1 processing skills may influence or constrain the development of ESL processing skills among native Arabic- and Japanese-speaking ESL learners. Finally, I discuss the methodology used in this study to examine the word-level processing skills of the two ESL groups.

WORD-LEVEL PROCESSING SKILLS IN READING

Reading and psycholinguistic research indicate that fluent and efficient reading involves the integration of information from an array of lower and higher level text processing skills. Accordingly, readers simultaneously process letter/phoneme, word, phrase/clause, sentence, local cohesion, topic, pragmatic, and discourse structure information to interpret and comprehend texts (Grabe, 1988; Just and Carpenter, 1980; Perfetti, 1985; Rayner & Pollatsek, 1989). However, each of these reading subskills or processes must compete for a limited amount of cognitive resources available in working memory (Crain & Shankweiler, 1990; Gibson, 1998; Just & Carpenter, 1992; MacDonald, 2000). When lower level processing skills such as word recognition or word integration function automatically, more text information can be processed and integrated in working memory (Crain & Shankweiler, 1990; Just & Carpenter, 1992; Perfetti, 1985). That is, if lower level processing skills at the word level are inefficient or underdeveloped, then reading speed and/or comprehension will be negatively affected because less information can be accessed and integrated in working memory at any given time. Certainly, efficient word-level reading or processing skills are essential for L1 and L2/ESL reading fluency and comprehension (Eskey, 1988; MacDonald, 2000; Perfetti, 1985).

Word-level reading processes involve word recognition processes, on the one hand, and word integration processes, on the other. Word recognition pertains to the ability to identify the printed (i.e., orthographic) form of a word or lexical
item in order to activate the word’s meaning, structural/syntactic information, and other pragmatic or world knowledge associations. Thus, word recognition processes function at a prelexical access stage and are necessary to identify and activate a word or lexical item (Seidenberg, 1992; Stanovich, 1991; Vellutino, Scanlon, & Tanzman, 1994). Word integration processes, on the other hand, involve the merging or integration of a word into larger phrase and clause units. Thus, as soon as each word or lexical item is recognized and identified, the word’s syntactic, semantic, and pragmatic information is immediately activated and utilized to integrate the word into phrase and clause structures and interpret it as rapidly as possible (Boland, 1997; Crocker, 1994; Frazier, 1987; Gibson, 1998; Hagoort, Brown, & Osterhout, 1999; Pickering & Traxler, 2000; van Berkum, Hagoort, & Brown, 1999; Weinberg, 1999). Word integration processes can be referred to as postlexical word processing skills. Research shows that reading times on individual words in sentences are largely a reflection of prelexical word recognition processes and postlexical word integration processes (Gibson, 1998; Just & Carpenter, 1980; Rayner & Sereno, 1994; Rayner, Sereno, Morris, Schmauder, & Clifton, 1989).

Because the term word integration can be used to describe a range of mental processes involved in combining words together into larger phrase and sentence structures, it is important to distinguish between fluent lower level processes and more effortful, consciously controlled processes involved in word integration. On the one hand, word integration skills involve relatively automatic or fluent perceptual processes that are often associated with a sentence parser (Caplan & Waters, 1999; Hoover & Dwivedi, 1998; Pienemann, 1998). It is generally assumed that these automatic or fluent word integration skills are lower level skills that are beyond conscious control or manipulation (e.g., Caplan & Waters, 1999; Jackendoff, 1997; Rayner & Pollatsek, 1989). On the other hand, word integration also involves more effortful processing procedures and strategies that a reader can consciously control and manipulate, including certain types of elaborative inferencing procedures (e.g., Garrod & Sanford, 1998; McKoon & Ratcliff, 1992), problem solving or debugging procedures in response to comprehension errors (e.g., Brown, 1980), reasoning and logic processes (e.g., Caplan & Waters, 1999), retrieval and use of grammar rules and translation processes (e.g., Chavez, 1994; Kern, 1994), or use of processing strategies relying on conceptual and/or background knowledge and cognitive heuristics (e.g., Lee & VanPatten, 1995; Pienemann, 1998). Certainly, fluent L1 and L2 readers utilize an array of mental processes to comprehend sentences when they read, but the focus of this study examines the use of fluent, lower level word integration skills to parse and integrate words into phrase and clause structures.

NATIVE ARABIC- AND JAPANESE-SPEAKING ESL READERS—DIFFERENT WORD-LEVEL PROCESSING PROBLEMS

Many ESL practitioners have observed that Arab and Japanese ESL students experience different types of problems and difficulties at the word level while reading English texts. Arab ESL students seem to experience considerable diffi-
culties with word recognition processes at a prelexical access stage in word reading. In fact, experiments within the same–different matching methodology have generated evidence to this effect (Brown & Haynes, 1985; Ryan & Meara, 1991), though as yet there is little corroborating evidence from other methodologies such as lexical decision tasks. Japanese ESL readers, on the other hand, seem to experience more difficulty relative to other ESL groups with ESL word integration processes. Juffs (1998a, 1998b) found evidence that even relatively proficient Japanese and Korean ESL speakers experience considerable problems in rapidly integrating words into larger units of meaning, even though they clearly had the requisite linguistic knowledge to do so. Thus, Arab and Japanese ESL readers seem to exhibit different types of word-level processing problems.

To summarize, Arab ESL readers seem to have difficulty with prelexical word recognition processes, whereas Japanese ESL readers appear to have more difficulties with postlexical word integration processes. In part, these difficulties are likely due to how the L1 word-level processing skills of each ESL group shapes the development of their respective ESL word-level processing skills. However, there is a lack of empirical evidence identifying the different word-level processing difficulties for Arab or Japanese ESL students. The present study was an attempt to fill that gap in the literature.

WORD RECOGNITION SKILLS

Orthographic structure and corresponding processing skills

There is substantial evidence indicating that L1 word recognition processes develop differently across different orthographies because orthographies utilize different representational units and encode different amounts of phonological information in the graphic display (Perfetti & Tan, 1998; Seidenberg, 1992; Tzeng & Wang, 1983). For example, Italian, Arabic, and English utilize alphabetic orthographies that encode language at the level of phonemes; hence, graphemes (i.e., letters) closely correspond to consonant and vowel phonemes. In contrast, the Chinese and Japanese (i.e., kanji) logographic orthographies encode language at the level of lexical morphemes, which generally correspond to words or word parts (Chen, 1992; Leong & Tamoaka, 1998). Consequently, logographic orthographies encode substantially less sublexical phonological information than alphabetic orthographies (Perfetti & Tan, 1998; Wydell, 1998). Clearly, orthographic scripts vary structurally in how they encode and map onto language. Furthermore, the structure of the orthographic scripts shapes the underlying processes involved in L1 word recognition (Abu-Rabia, 1997a; Perfetti & Tan, 1998; Tzeng & Wang, 1983).

English orthographic structure and corresponding processing skills

The English orthography encodes a large amount of phonological information through grapheme–phoneme correspondence rules, though English has many inconsistencies with regards to how vowels are represented in the orthography.
As well as a variety of context-sensitive grapheme-phoneme irregularities (Berent & Perfetti, 1995; Cortese & Simpson, 2000). Therefore, the English orthography is considered less phonologically transparent than orthographies with highly consistent grapheme-phoneme correspondences like Italian and German (Katz & Frost, 1992). Research indicates that the ability to recognize English words rapidly, particularly with irregular grapheme-phoneme mappings (e.g., business, cough, iron), is in part accounted for by orthographic processing skills and knowledge that are independent of phonological processing skills (Barker, Torgesen, & Wagner, 1992; Olson, Forberg, Wise, & Rack, 1994; Stanovich & West, 1989). Furthermore, the development of fluent English word recognition skills likely involves the acquisition of highly specified orthographic representations of words and spelling patterns that occur across the English orthography (Perfetti, 1991; Plaut, McClelland, Seidenberg, & Patterson, 1996; Rey, Ziegler, & Jacobs, 2000). Therefore, mature and fluent readers of English develop and utilize orthographic and phonological component processing skills to facilitate word recognition (Gough & Walsh, 1991; Perfetti, 1991; Seidenberg, 1992; Stanovich, 1991).

L1 word recognition development and effects on ESL word recognition

Native speakers of Arabic spend their first years in primary school developing L1 Arabic literacy skills through a phonologically transparent orthography with a highly consistent set of grapheme-phoneme correspondences (Abu-Rabia, 1997a, 1999; Wagner, 1993). Consequently, L1 word recognition skills in Arabic develop through a reliance on phonological processing skills (Abu-Rabia, 1997b). Later, more mature and experienced Arab readers learn to use a less transparent or deeper orthography that does not include diacritic marks that signal vowel information in word spellings, which not only underspecifies printed word forms, but also creates ambiguity (Abu-Rabia, 1997a, 1997b, 1999). Regardless, research clearly shows that both skilled and unskilled Arab readers rely extensively on phonological processing skills during L1 word recognition and identification (Abu-Rabia, 1997a, 1997b, 1999; Bentin & Ibrahim, 1996; Wagner, 1993).

Recent research indicates that L1 word recognition skills interact with and shape the development of L2/ESL word recognition skills (Akamatsu, 1999; Chikamatsu, 1996; Holm & Dodd, 1996; Koda, 1998; Wade-Woolley, 1999). For example, phonological awareness and phonological processing skills transfer between L1 and L2 alphabetic literacies that do not share in the same orthography, as in Arabic and French (Wagner, Spratt, & Ezzaki, 1989) and Greek and English (Chitri & Willows, 1997). Hence, it seems plausible that Arab ESL students would rely on phonological processing skills developed through their L1 literacy experience when reading ESL words in texts and in isolation. If this is the case, Arab ESL learners are likely to have significant difficulty developing fluent ESL word processing skills because phonological processing procedures may be slower and less efficient than word recognition procedures that utilize both phonological and orthographic processing skills, particularly for highly familiar words (Olson, Kligle, Davidson, & Foltz, 1985; Seidenberg & McCle-
land, 1989; Seidenberg, 1992). More importantly, overrelying on phonological processing during word recognition may prove difficult because English words have inconsistent or irregular grapheme–phoneme mappings, particularly for vowels (e.g., done, cough, great). For these reasons, Arabic ESL learners developing ESL literacy skills may exhibit less efficient and perhaps even less accurate word recognition skills than other ESL populations (e.g., Japanese ESL readers).

Native Japanese speakers, on the other hand, develop a sophisticated set of word recognition skills through their L1 literacy experience. For one, the Japanese writing system incorporates both a syllabary and a logography. The syllabary systems, called *katakana* and *hiragana*, utilize graphic characters that roughly correspond to a syllable unit. However, the logography, called kanji, encodes morphemes with much less sublexical phonology compared to printed words in alphabetic (e.g., English) or syllabic (e.g., *katakana*) orthographies. Consequently, processing kanji requires extensive orthographic processing skills with much less of a connection to sublexical phonemes and phonological mediation during word recognition compared to alphabetic orthographies (Akamatsu, 1998; Saito, Masuda, & Kawakami, 1998; Wydell, 1998). In short, native speakers of Japanese develop orthographic processing skills that are, in some ways, distinct and independent from phonological processing skills, even during the initial stages of L1 word recognition and literacy development. Subsequently, Japanese ESL learners may be able to utilize their L1-based orthographic processing skills to acquire a well-developed set of graphic ESL word representations that facilitate English word processing fluency and accuracy (cf. Ehri, 1997; Seymour, 1997). In contrast, Arab ESL speaker/readers may develop less fluency with English word recognition if they overrely on phonological processing skills, which may result in slower and perhaps even less accurate ESL word recognition skills.

**WORD INTEGRATION SKILLS**

*Phrase and clause structure and word integration skills*

In general, structural features of the L1 seem to shape the corresponding L1 processing procedures. Thus, much like the structure of the L1 orthography shapes the development of underlying L1 word recognition skills in particular ways (Frost et al., 1987; Seidenberg, 1992; Tzeng & Wang, 1983), the linguistic features of the L1 phrase and clause structures shape the underlying L1 word integration or sentence parsing procedures in particular ways (Bates, Devescovi, & D’Amico, 1999; Frank & Vijay–Shanker, 2000; Mazuka, 1998).

A vast majority of the research examining word integration (i.e., incremental sentence processing) has focused on L1 English processing skills. However, sentence processing research with other languages clearly exhibits the incremental nature of word integration and sentence processing procedures (e.g., Hoover & Dwivedi, 1998, and Frencke–Mestre & Pynte, 1997, with French sentence processing; Konieczny, Hemforth, Scheepers, & Strube, 1997, and Frederici &
Sentence processing research shows that word integration processes across languages utilize syntactic category (i.e., part of speech) information, agreement features (e.g., subject-verb and adjective-noun agreement), case-marking information, verb complement and semantic argument information, as well as other semantic/conceptual information, to incrementally integrate words into phrase and clause structures and interpret them as rapidly as possible. Of course, the role each type of information plays in incremental sentence processing depends on the availability of these features in the language. For example, English utilizes very little, if any, overt case marking and gender marking features, whereas German and Japanese employ such features to inform on-line incremental word integration processes (Frederici & Frisch, 2000; Gunter, Friederici, & Schreiers, 2000; Inoue & Fodor, 1995; Yamashita, 1997). L1 English sentence processing and word integration research has focused on the role of syntactic category, verb complement, semantic verb argument, and in some cases, general semantic/conceptual information to guide initial word integration and interpretation procedures (Altmann et al., 1992; Boland, 1997; Britt et al., 1992; Frazier, 1987; Garrett, 2000; Gibson, 1998; Holmes et al., 1989; McElree & Griffith, 1995; Mitchell, 1994; Mitchell & Corley, 1994; Murray & Rowan, 1998; Ni et al., 1998; Rayner & Pollatsek, 1989; Trueswell et al., 1993; Trueswell & Kim, 1998).

Though not much on-line word integration and sentence processing research has been conducted in L2/ESL, the initial research in this area indicates that relatively proficient L2/ESL speakers develop word integration skills very similar to native speakers (Bernhardt, 1986; Frenck–Mestre, & Pynte, 1997; Hoover & Dwivedi, 1998; Juffs, 1998a, 1998b; Juffs & Harrington, 1995, 1996; Pienemann, 1998). In the case of ESL, research shows that proficient ESL speakers utilize syntactic category, verb complement and semantic verb argument information among other constraints to incrementally integrate words into larger phrase and sentence structures (Frenck–Mestre & Pynte, 1997; Juffs, 1998a; Juffs & Harrington, 1996).

**L1 word integration effects on ESL word integration**

There are indications that L1 word integration processes influence and shape the development of L2/ESL word integration processes, especially among those acquiring the L2/ESL during adolescence or later (Fender, 2001; Gass, 1987; Juffs, 1998a; Kilborn, 1994). Thus, we would expect that Japanese and Arab ESL learners exhibit some differences in ESL word integration and sentence processing skills as a consequence of the linguistic structures of their respective native languages. For example, verb phrases in Japanese and Arabic require different word orders. The following examples illustrate this structural difference between Arabic and Japanese. The first sentence is Arabic and the second sentence is Japanese; they are taken from Homeidi (1994) and Yamashita (1997), respectively.
The verbs in the two sentences are in italics. In the Arabic sentence above, the verb *a?t-aa*, which means to give, is in the initial position in the verb phrase (i.e., a head initial phrase structure) and is thus processed before the subject (Mohammed) and objects (Ahmed and book). In Japanese sentences like that above, the opposite order occurs and the subject and objects are processed before the verb (i.e., a head-final phrase structure).

Since Japanese has a head-final phrase structure, native Japanese speakers acquire a particular set of L1 word integration processing skills that reflect the head-final phrase structure of Japanese. Word integration processes in head-final languages like Japanese or Korean reflect the fact that verbs must follow their verb complements (e.g., direct objects, sentential complements). Therefore, Japanese and Korean words are integrated into the verb phrase using a different set of word integration procedures that reflect the structural position of the verb, and consequently the timing and availability of the verb subcategorization (i.e., verb complement) information. Mazuka (1998) and Pritchett (1992) have argued that a L1 Japanese sentence processor can only fully integrate words into larger phrase and clause structures when the phrase heads (e.g., verbs) are processed in phrase-final positions. As a result, the sentence processor must delay fully integrating words into verb phrase and clause structures until the verb is parsed in the phrase and clause final position, as in sentence 2.

These word integration processes vary considerably from the word integration process utilized with head-initial languages like English. Some recent research indicates that Japanese and other East Asian ESL speakers do, in fact, have significantly more difficulty than other ESL groups when incrementally integrating English words into phrase and clause structures during on-line language processing. Juffs (1998a, 1998b) found that relatively proficient ESL speakers from Japan, Korea, and China have considerable difficulty using verb complement and argument knowledge to integrate words into verb phrase and clause structures in certain types of garden path sentences. In contrast, proficiency-matched ESL speakers whose L1 was a Romance language did not exhibit similar word integration problems. These results indicate that the Japanese and other East Asian ESL speakers exhibited a delayed use of verb complement and argument information to integrate words into verb phrases.

In summary, it appears to be the case that ESL learners from head-final languages like Japanese and Korean have difficulties developing fluent ESL word integration or sentence processing skills. This would potentially be reflected in how Japanese ESL students used English verb information to incrementally structure and interpret English verb phrase and clause constructions.

In contrast, Arabic and English share several similarities in terms of general phrase and clause structure, and thus an overlap with some structural word inte-
gration processes between the two languages. The most common word order in Modern Standard Arabic (MSA) and other Arab dialects involves head-initial verb phrases in verb–subject–object and subject–verb–object clause structures (Benmamoun, 2000; Mohammad, 2000). Though many Arabic dialects including MSA allow some variation of word order because of the overt case-marking system, the Arab dialects including MSA exhibit head-initial characteristics in that prepositions precede the noun phrase objects in the prepositional phrase they govern, and verbs always precede their sentential complements (i.e., equivalents of that-clause complements in English). In addition, it is much more common for verb complements to follow verbs in verb phrase structures and verb complements without case almost always follow their licensing verbs (Homeidi, 1994; Mohammad, 2000). In short, these structural patterns suggest a head-initial pattern in MSA and the Arab dialects that overlaps considerably with English in terms of basic phrase structure configurations.

Consequently, Arab and English word integration processes at the basic phrase construction level are likely to be similar in many respects, especially because verb complement and argument information is available to integrate words downstream in the sentence into larger verb phrase and clause constructions. That is, lexical information (i.e., argument or complement requirements) that guides subsequent word attachment and integration procedures in phrase construction in the L1 (e.g., Arabic) can also help facilitate word integration procedures in the L2/ESL. In contrast, Japanese ESL learners may have considerable difficulty developing ESL word integration skills, particularly with regards to integrating verbs and verb complements into verb phrases. These L1 word integration effects should be apparent in ESL word integration reading times and/or comprehension outcomes of Arab and Japanese ESL students.

EXPERIMENT 1

A lexical decision task was used to examine the word recognition skills of Arab and Japanese ESL students. In this task, participants viewed a series of word or nonword stimulus items on a computer screen in order to determine whether each item was a word (i.e., lexical item) or not a word. The lexical decision task is one of the most widely used research methods to assess word recognition skills in L1 research (Frost et al., 1987; Lewellen, Goldinger, Pisoni, & Greene, 1993; Sereno, 1991) and in L2/ESL word research (Chikamatsu, 1996; Segalowitz & Segalowitz, 1993; Segalowitz, Watson, & Segalowitz, 1995). The task requires the use of word recognition skills to recognize a word or lexical item in order to respond.

Participants

Twenty native Japanese-speaking ESL participants and 19 native Arabic-speaking ESL participants took part in the study. These participants were recruited from intermediate and low-advanced level ESL courses at two intensive English language programs. All the ESL participants completed all the tasks and were included in all the analysis. In addition, 19 native English speakers who were
undergraduate students from a university in the United States participated in the study. The native speaker data provides a baseline measure of fluent English word processing performance and is only used for descriptive comparisons.

In order to control for differences in English language proficiency and other key background variables, the participants were administered the reading comprehension subsection of the Michigan Test and a background questionnaire. The participants reported information about their age, the length of English (EFL) study in their home country in years, length of English (ESL) study in the United States in months, and total length of stay in the United States in months. The means and standard deviations of these variables are reported in Table 1. There were no significant differences between the two groups in terms of raw Michigan reading scores, \( t(37) = .794 \); length of EFL study \( t(37) = 1.39 \); length of ESL study, \( t(37) = 1.39 \); age, \( t(37) = .267 \); and length of stay in the United States, \( t(37) = .994 \). The reading subsection of the Michigan Test was utilized as a covariate in the statistical analysis of the data.

**Stimuli**

There were two primary sets of stimulus items that are English words, namely consistent words and inconsistent words (see Appendix A). Each set of items consisted of 20 words each. The consistent word stimuli were composed of words that are four to six letters long and exhibit highly consistent grapheme–phoneme correspondences in the English orthography (e.g., *game* and *letter*). The second set of English words was inconsistent words (e.g., *gone* and *great* have inconsistent vowels in terms of letter–phoneme correspondences). For example, the word *great* is inconsistent in grapheme–phoneme mapping compared to other words that share the spelling pattern *eat*, such as *heat*, *beat*, *meat*, and *cheat*. These inconsistent words are also four to six letters long. In addition, there was a third set of longer English words that were used as foils (e.g., *business and important*).

A total of 60 nonword stimuli were used in the lexical decision task. Twenty of the nonword items are pronounceable nonwords (e.g., *fird* and *golph*). Twenty of the other nonword items violated English spelling conventions and were thus
nonpronounceable letter string (e.g., \textit{pdelle} and \textit{gpolh}). Finally, 20 long non-words were employed (e.g., \textit{balproby} and \textit{uynsitver}).

\textbf{Procedure}

The lexical decision task was run on a computer using the E-prime software package (Schneider, 2000). The software controlled the presentation of stimulus material while recording response selections and reaction times. After reading the directions and looking at some example items, the participants were given a practice trial of 12 items. The participants began the task by viewing an asterisk in the center of the computer screen. The participants then pressed a space bar when they were ready to see the first word. The asterisk remained on the screen for 2 s and then disappeared, and a stimulus item that was either a word (e.g., \textit{call}) or a nonword (e.g., \textit{folp}) appeared. The participants responded by pressing a designated key on the keyboard marked \textit{Yes} if they thought the item was an English word or a designated key marked \textit{No} if they thought the item was not an English word. They were instructed to respond as quickly but accurately as possible. In addition, the participants were instructed to keep their index or middle finger on the response keys and use their thumbs to press the space bar for the next word. In this way, the participants could respond rapidly.

After the participants responded, they then saw the asterisk again. When they were ready for the next stimulus item, the participants pressed the space bar, the asterisk remained on the screen for 2 s, and it was replaced by the next word or nonword item. Again, the participants responded as quickly as possible with a lexical decision. The participants repeated the above process for the stimulus items in the practice trials and the 120 stimulus items (60 word and 60 nonword items) in the experimental trials. The stimulus items were presented randomly. The computer recorded the length of time each stimulus item was on the screen from the presentation onset to the lexical decision response. In addition, the computer recorded the lexical decision responses.

\textbf{WORD RECOGNITION ANALYSIS AND RESULTS}

\textit{Word recognition speed}

Only the correct lexical decision responses were used to compare the word recognition speed of the two ESL groups. Also, lexical decision times over 3 s were timed out and recorded as incorrect responses. In all, 2.1\% of the response times (RTs) were thrown out as incorrect responses because they were inaccurate or timed out responses. Word recognition speed was calculated from the average of the total correct RTs over the correct number of responses. Since there were two word conditions, an average RT was calculated for each participant for each of the word conditions (i.e., consistent and inconsistent). Each participants’ average RTs were then used to calculate the L1 group means for each of the two word conditions.

A two-way repeated-measures analysis of covariance (ANCOVA) was used to compare the word recognition speed of the two ESL groups. The L1 (i.e.,
Table 2. Mean lexical decision response times (ms) of the native speakers and ESL groups for consistent, inconsistent, and long words

<table>
<thead>
<tr>
<th>Language Group</th>
<th>Consistent M</th>
<th>Consistent SD</th>
<th>Inconsistent M</th>
<th>Inconsistent SD</th>
<th>Group Means</th>
</tr>
</thead>
<tbody>
<tr>
<td>Native speakers</td>
<td>674</td>
<td>146</td>
<td>641</td>
<td>116</td>
<td>658</td>
</tr>
<tr>
<td>Japanese</td>
<td>800</td>
<td>150</td>
<td>769</td>
<td>129</td>
<td>785</td>
</tr>
<tr>
<td>Arab</td>
<td>1,039</td>
<td>286</td>
<td>1,020</td>
<td>282</td>
<td>1,030</td>
</tr>
<tr>
<td>Condition means</td>
<td>838</td>
<td>810</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Japanese and Arabic) was the between-subjects variable in the analysis. The RTs across the two word conditions (i.e., consistent, inconsistent) were the dependent variables. The RTs in these two word conditions were used as the repeated-measure, within-subject variables in the analysis. Michigan Reading Test results were utilized as a covariate in the analysis.

Table 2 summarizes the results of the lexical decision response times (ms) for the two ESL groups and the native English speaker group in terms of the group means and standard deviations across the two types of stimuli, consistent and inconsistent words. Again, the native speaker data are only presented as baseline data for descriptive purposes and were not included in any of the statistical analysis.

The results of the $2 \times 2$ (language group by word condition) repeated-measures ANCOVA revealed a main effect for language group, $F(1, 36) = 9.41, p = .004$. There was no main effect for word condition, $F(1, 36) = 2.34, ns$, and there was no interaction between the language group and word condition factors, $F(1, 36) = .34, ns$. The mean values across the two word conditions clearly indicate that the Japanese ESL participants were able to process consistent and inconsistent words in a lexical decision task more rapidly than the Arab ESL participants, which is reflected in the overall group means for the Japanese (785 ms) and Arab (1030 ms) participants across the two word conditions. Overall, the Japanese participants exhibited a fairly uniform, 240-ms advantage over the Arab participants across the consistent and inconsistent word conditions.

**Word recognition accuracy**

Table 3 presents the results of the lexical decision accuracy of the two ESL groups and the native-English speaking group. A $2 \times 4$ (language group by word condition) repeated-measures ANCOVA was utilized with language group as the between-subjects factor and word condition as the within-subjects factor. The Michigan reading results were utilized as a covariate in the analysis. There was a significant effect for language group, $F(1, 36) = 6.83, p = .013$. The mean scores indicate that the Japanese participants performed more accurately across the four conditions than the Arab participants. Not surprisingly, a significant main effect was also found for the word condition, $F(3, 108) = 65.2, p < .001$. 
Table 3. Mean lexical decision accuracy results of the two ESL groups across word and nonword conditions

<table>
<thead>
<tr>
<th>Condition</th>
<th>Japanese M</th>
<th>Japanese SD</th>
<th>Arab M</th>
<th>Arab SD</th>
<th>Native Speakers M</th>
<th>Native Speakers SD</th>
<th>Condition Means</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consistent</td>
<td>19.75</td>
<td>0.55</td>
<td>19.16</td>
<td>1.12</td>
<td>19.74</td>
<td>0.56</td>
<td>19.55</td>
</tr>
<tr>
<td>Inconsistent</td>
<td>19.95</td>
<td>0.22</td>
<td>19.47</td>
<td>0.96</td>
<td>19.47</td>
<td>1.07</td>
<td>19.63</td>
</tr>
<tr>
<td>Pseudoword</td>
<td>13.41</td>
<td>5.36</td>
<td>10.11</td>
<td>5.34</td>
<td>17.74</td>
<td>3.18</td>
<td>13.75</td>
</tr>
<tr>
<td>Nonpronounceable</td>
<td>18.25</td>
<td>2.73</td>
<td>15.74</td>
<td>3.25</td>
<td>19.37</td>
<td>0.90</td>
<td>17.79</td>
</tr>
<tr>
<td>Group means</td>
<td>17.18</td>
<td>14.66</td>
<td>19.01</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Although the interaction effect between the word condition and language group approached significance, there was no interaction effect found between the language group and word condition factors, $F(3, 108) = 3.75, p = .061, ns$. A post hoc analysis indicated that the Japanese group was significantly more accurate in judging the nonpronounceable nonwords.

EXPERIMENT 2

A sentence reading task was used as a measure of word integration skills of the two ESL groups. In this task, the study participants read 60 sentences on the computer using the moving window technique. The participants read a series of sentences word by word at their own pace while the computer recorded the word reading times. Reading times on the words reflected not only word recognition processes, but also syntactic and semantic/conceptual processes that underlie word integration skills (Frenck–Mestre & Pynte, 1997; Garrett, 2000; Gibson, 1998; Juffs & Harrington, 1995; Rayner & Sereno, 1994; Trueswell et al., 1993).

Participants

The same participants in Experiment 1 also participated in Experiment 2.

Stimuli

With the exception of three words (baker, pilot, plane), all of the words in the experimental sentences appear in Hill’s (1980) 1500-word list, which is a list of words estimated to be within the first 1500 words that EFL/ESL students learn. In addition, all the verbs in the sentence were verbs with a high frequency of occurrence in the Interchanges text series by Jack Richards (1997), a widely used ESL/EFL text for beginning and intermediate ESL/EFL students. The Interchanges frequency count is a strong indicator of word familiarity and competence among ESL/EFL students at beginning and intermediate levels. Word length was also an important factor as well. Thus, all the words in the sentence prior to the direct object were one- or two-syllable words.
The other crucial factor was the sentence structure. All of the experimental sentences had the same number of words and consisted of the following structure: subject noun + prepositional phrase + auxiliary will + main verb + the + objective noun + prepositional phrase (see Appendix B). All the experimental sentences in this task also involved transitive verbs that require a direct object noun phrase (i.e., direct object complement). Thus, the experimental sentences require the participants to integrate or attach the direct object noun phrase as a verb complement in the verb phrase, then interpret the direct object according to the semantics of the verb (i.e., the theme argument of the verb). Because of the syntactic and semantic integration processes involved, the reading times on direct object nouns were taken as a measure of word integration speed and fluency.

The semantic context of the sentence was manipulated as follows. The high context condition was created with a subject noun, a noun in a prepositional phrase, and a verb that were semantically/conceptually related to the object. That is, the subject noun, modifying prepositional phrase and the verb conjoined to provide a context with a high degree of semantic/conceptual association or plausibility for the direct object as in sentence 3 below:

3. The waiter in the kitchen will bring the food to the table.
4. The lady in the office will bring the food to the party.

The first sentence is a high semantic context sentence because the subject noun, prepositional phrase and verb are conceptually related to the direct object noun. The second sentence is a low semantic context sentence because no such comparable conceptual or semantic association exists among the sentence constituents preceding the direct object. Finally, it is important to note that the exact same verb and direct object combinations appeared across both the high and low semantic context conditions (as in sentences 3 and 4 above).

Procedures

The participants read 60 sentences in random order in a sentence reading task. After task instructions and examples, the participants read sentences in a practice trial. There were 10 sentences in the practice trial. The participants began the moving window practice trial with an asterisk on the screen. When the participants were ready, they could proceed by pressing the space bar to read the first word. Only the first word of the sentence appeared on the screen in the sentence-initial position (i.e., the extreme left-hand side of the sentence). When the participants were ready for the next word, they pressed the space bar, and at that point, the first word disappeared from the sentence initial position and the second word in the sentence appeared in the second word position in the sentence. Then, when the participants were ready for the next word, they pressed the space bar. At that point the second word disappeared from the second spatial position in the sentence and the third word appeared in the third sentence position. The last word in the sentence appeared with a period. In this manner, the
participants proceeded to read the sentence from left to right across the computer screen at their own pace.

Then after the participants had read the last word with the period, they pressed the space bar and saw a true/false statement based on the sentence they had just read. The true/false statements served several purposes. The participants needed to attend to the meaning of the sentence in order to answer the true/false statement. The participants who answered the true/false item incorrectly likely had some reading performance error such as a lapse in concentration or some mistake in reading. The participants selected a designated key to indicate that the true/false item was true, and another designated key on the other side of the keyboard that indicates that the true/false item was false. Immediately after the true/false response, the participants then saw the asterisk in the middle of the screen. When they were ready to read the next sentence, the participants then pressed the space bar and the sentence reading procedure was repeated. The computer recorded the length of time a stimulus item was on the screen from the press of the space bar for stimulus presentation to the lexical decision response.

WORD INTEGRATION ANALYSIS AND RESULTS

Word integration speed

For the sentence reading task, only the direct object RTs of the sentences with correct true/false responses were used in the analysis. Also, direct object reading times over three seconds were timed out as errors and not included in the analysis. In all, 13.6% of the data were thrown out due to incorrect true/false responses or timed out errors (i.e., performance errors). The correct RTs were then used in the analysis to compare the two ESL groups. Again, the native-speaker data is provided for descriptive purposes only and is not entered into any of the statistical analysis.

A 2 × 2 (language group by semantic context) repeated-measures ANCOVA was used to analyze the data. The L1 group was the between-subjects variable in the analysis. Again, the Michigan reading results were utilized as a covariate. The semantic context condition was the within subjects variable with two levels, a high and low semantic context level. The direct object reading times (i.e., RTs) were the dependent measure. Table 4 presents the reading times on the direct objects in the sentence reading task. There was no main effect for language group, \( F (1, 36) = .154 \). Therefore, the Japanese and Arabic participants processed the direct objects at the same rate. As expected, there was a main effect for context with the high context (i.e., plausible) direct objects being read faster than the low context direct objects, \( F (1, 36) = 13.51, p = .001 \). This reflects the difficulty involved in semantically integrating low context or implausible direct objects relative to high context or plausible objects, a result consistently found with native English speakers as well (e.g., Murray & Rowan, 1998; Pickering & Traxler, 1998). There was no interaction between the language group and context factors, \( F (1, 36) = .002, ns \), indicating that both groups were equally sensitive to the high and low semantic context conditions. Therefore,
Table 4. Reading times (ms) on the direct objects of the native speakers and two ESL groups in the sentence reading task for the high and low context conditions

<table>
<thead>
<tr>
<th>Language Group</th>
<th>High Context</th>
<th>Low Context</th>
<th>Group Means</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
</tr>
<tr>
<td>Native speakers</td>
<td>424</td>
<td>148</td>
<td>485</td>
</tr>
<tr>
<td>Japanese</td>
<td>706</td>
<td>175</td>
<td>808</td>
</tr>
<tr>
<td>Arab</td>
<td>740</td>
<td>186</td>
<td>840</td>
</tr>
<tr>
<td>Condition means</td>
<td>623</td>
<td></td>
<td>711</td>
</tr>
</tbody>
</table>

the only significant finding was that both the Japanese and Arab ESL participants were able to semantically integrate the direct objects in the high context condition faster than the direct objects in the low context condition.

Word integration accuracy

Assessment of word integration accuracy ultimately involves the ability to successfully comprehend the clause or sentence structures in the moving window task. In short, structural and semantic/conceptual integration processing skills constrain the word-by-word sentence processing procedures that underpin comprehension accuracy. This follows from the fact that incremental structuring and interpreting processes function together and guide sentence interpretation and comprehension outcomes. Therefore, comprehension is a function of the structural integration and semantic/conceptual interpretation processes. The better these word integration processes function, the more accurate the comprehension outcomes will be.

Word integration accuracy was measured by a series of true/false items that appeared after each experimental sentence was read in the subject-controlled, word by word manner. It is important to note that the study participants were able to read the entire true/false statements on one screen, and thus not in a word by word manner. In addition, they were given as much time as they needed to read the true/false item and respond. Therefore, the primary determinant of the accuracy score was the word by word reading comprehension of the experimental sentences.

Table 5 presents the word integration and comprehension accuracy results of the two language groups across the high and low context conditions. The results of a $2 \times 2$ (language group by semantic context) repeated-measures ANCOVA revealed a significant effect for language group, $F(1, 36) = 6.80, p = .013$. Mean values across both context conditions indicate that the Arab participants were significantly more accurate at word integration and comprehension than the Japanese participants. There was no main effect for context, $F(1, 36) = 1.03, ns$, indicating that the Arab and Japanese subjects showed no significant differences in word integration accuracy between the high context and low context sentences. Finally, there was no interaction between the language group and context.
Table 5. Word integration and comprehension accuracy for the native speakers and two ESL groups in the sentence reading task for the high and low context conditions

<table>
<thead>
<tr>
<th>Language Group</th>
<th>High Context</th>
<th>Low Context</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$M$</td>
<td>$SD$</td>
</tr>
<tr>
<td>Native speakers</td>
<td>11.21</td>
<td>1.55</td>
</tr>
<tr>
<td>Japanese</td>
<td>10.21</td>
<td>1.15</td>
</tr>
<tr>
<td>Arab</td>
<td>10.74</td>
<td>1.19</td>
</tr>
<tr>
<td>Condition means</td>
<td>10.72</td>
<td></td>
</tr>
</tbody>
</table>

factors, $F (1, 36) = .11, ns$. Therefore the main effect of language group can be interpreted without qualification.

These results indicate that the Arab ESL participants were significantly more accurate than the Japanese ESL participants in integrating words on-line into larger units of meaning and comprehending them.

GENERAL DISCUSSION

The results indicate that the Japanese and Arab participants have different word-level processing difficulties. Specifically, the Arab participants exhibited word recognition difficulties in comparison to the Japanese participants on a lexical decision task, indicating that the Arab participants have less developed and less fluent English word recognition skills than their Japanese counterparts. In contrast, the Japanese participants were significantly less accurate than the Arab participants in integrating English words into larger phrase and clause units of meaning and consequently comprehending them in an on-line sentence reading task.

**ESL word recognition**

Overall, the speed and accuracy results from the lexical decision task indicate that the Japanese participants have a more fluent set of word recognition skills than the Arab participants. This is supported by the 240-ms speed advantage demonstrated by the Japanese participants for both the consistent and inconsistent English words and the Japanese participants’ accuracy in rejecting nonwords as possible English words, especially nonpronounceable nonwords that constitute nonpermissible spelling patterns in the English orthography. These results are generally consistent with other research and suggest that Japanese ESL learners may be more biased toward developing visual or orthographic modes of processing ESL words without being encumbered by extensive phonological processing procedures (Akamatsu, 1999; Brown & Haynes, 1985; Wade–Woolley, 1999). Brown and Hayes (1985) found that Japanese ESL learners were significantly faster and more accurate in making same–different judgments of visually presented words, pseudowords, and geometric symbols.
than comparable groups of Arab and Spanish ESL learners, thus showing that the Japanese ESL learners were able to utilize significantly better visual-based processing skills across an array of stimulus types. Wade–Woolley (1999) found that Japanese ESL learners were significantly better than proficiency-matched Russian ESL learners at recognizing possible English spelling patterns. Taken together, Japanese ESL learners, in comparison to other ESL populations with L1 alphabetic backgrounds, are able to develop orthographic knowledge and processing skills to facilitate more rapid word recognition skills with familiar words (i.e., fluent sight vocabulary) and are able to acquire a more acute orthographic sensitivity in recognizing and identifying spelling patterns in the English orthography.

In contrast, the Arab ESL learners appear to have less fluent ESL word recognition skills, which may be due to a reliance on more extensive phonological processing skills. This may be a consequence of L1 word recognition effects along with an underdeveloped set of general and word-specific ESL spelling knowledge. In related research, Ryan and Meara (1991) found that intermediate Arab ESL learners were significantly slower and less accurate than other proficiency matched ESL learners in a same–different English word recognition task, though with longer words. Their research suggests that Arab ESL students lack word specific spelling knowledge, particularly with regards to graphemes or letter spellings representing vowels, which again are highly variable in their letter–sound (i.e., grapheme–phoneme) correspondences in English (see also Ryan, 1997). Thus, Arab ESL learners may encounter substantial problems learning to read English words due to the inconsistencies and irregularities of the English orthography. However, as Akamatsu (1999) and others have pointed out, ESL learners with phonological processing skills also exhibit certain advantages. For example, Brown and Haynes (1985) found evidence that Arab ESL learners were faster than Japanese ESL learners in generating phonological codes in a naming task with long letter strings, again indicating that Arab ESL learners utilize more extensive phonological processing skills.

The research evidence suggests that the Japanese ESL learners develop relatively fluent and accurate English word recognition skills relative to Arab ESL learners, at least with known and familiar words. Furthermore, it appears that the Japanese ESL learners are able to utilize general L1-based orthographic processing skills to facilitate ESL orthographic skills and knowledge that lead to ESL word recognition fluency. However, it is also quite likely that Japanese ESL learners develop relatively strong visual and orthographic representations of English words because of their extensive reading and writing experiences with English in their home countries. That is, ESL learners from Japan and other East Asian countries (i.e., Korea, Taiwan, and Mainland China) may spend considerable amounts of time developing print and literacy skills both in school and outside of school in preparation for university entrance exams (Brown & Haynes, 1985). Therefore, it seems quite plausible that the ESL word recognition skills of Japanese speakers may be due to visual and orthographic skills developed through L1 literacy experiences in conjunction with a substantial amount of English print experience in secondary school and in preparation for university entrance exams.
**ESL word integration processes**

There were no significant differences found between the Japanese and Arab ESL groups in the direct object reading times. Notably, the Japanese and Arab ESL participants read the high semantic context direct objects significantly faster than the low semantic context direct objects. The semantic context (i.e., semantic plausibility) effect clearly shows that low context direct objects require more semantic/conceptual processing effort than high context direct objects during incremental word integration processing. This is consistent with other word integration research with native English speakers that has consistently found longer reading times on implausible (i.e., low context) noun phrases compared to plausible (i.e., high context) noun phrases (Gibson, 1998; Murray & Rowan, 1998; Pickering & Traxler, 1998). Hence the findings of the current study and other research examining the integration of high and low context noun phrases clearly point to the immediate, incremental use of semantic/conceptual integration processes. In general, the processing or reading speed between the high and low context conditions indicates semantic word integration difficulties in the low context condition.

The word integration accuracy results are of particular importance in examining the overall syntactic/structural and semantic word integration skills of both groups. Though there were no differences in the reading times (i.e., word integration speed) on the direct objects, the Arab participants were significantly more accurate than the Japanese participants in integrating words into larger phrase and clause structures and comprehending them. In light of the Arab and Japanese participants being equally sensitive to the semantic context variable (i.e., high context and low context) during on-line word integration processes, the word integration accuracy and consequent comprehension difference between the two groups may be due to structural word integration processes that incrementally integrate and establish the noun phrases in structural positions (i.e., as the subject noun phrase, the object noun phrase of the preposition in the postnominal modifier, or the direct object noun phrase in the verb phrase). It is important to keep in mind that psycholinguistic research in both L1 research (Fodor, Ni, Crain, & Shankweiler, 1996; Garrett, 2000; Gibson, 1998) and in L2/ESL research (Frenck-Mestre & Pynte, 1997; Juffs, 1998a; Juffs & Harrington, 1996) shows fluent English word integration processes involving incremental syntactic/structural word attachments into phrase and clause structures. In addition, structural word integration processes that establish structural relationships among sentence constituents are an important component in incremental word integration procedures that guide and constrain sentence comprehension processes (Boland, 1997; Jackendoff, 1997; Mahesh et al., 1999).

In short, the word integration results suggest that the Arab participants were able to use more extensive ESL word integration processes than the Japanese participants. This may be a direct consequence of L1–Arabic word integration processes overlapping with ESL word integration processes at the level of phrase and clause integration processes. That is, both languages share many right branching characteristics and corresponding word integration processes, particularly with verb phrase constructions. These overlapping L1–ESL struc-
tural and word integration processes may enable the Arab participants to incrementally generate a sentence representation that incorporates a more stable or complete structural configuration of the sentence elements. In other words, syntactic or structural integration processes likely facilitate the correspondence between the syntactic functions and the semantic arguments of the noun phrases based on structural principles (cf. Jackendoff, 1997; Pinango, 2000). In that case, the Arab participants may be able to incrementally process sentence constituents (i.e., nouns, verbs, prepositions) as both syntactic and semantic objects during incremental word integration processes.

**Pedagogical implications**

Clearly, all ESL learners must gradually acquire expanding sets of processing skills on their path to English language proficiency in general and ESL reading in particular. However, the current study indicates that particular ESL populations have special needs in developing lower level processing skills relative to other ESL groups. Arab ESL learners have particular difficulty in developing word recognition skills relative to Japanese and other ESL groups (Ryan & Meara, 1991). Japanese ESL learners, on the other hand, have particular difficulties with developing incremental word integration skills relative to Arab and other ESL groups (Juffs, 1998a, 1998b).

Consequently, many Arab ESL learners could benefit from different types of word recognition games or tasks on the computer. Perhaps more importantly, Arab ESL learners should be engaged in reading more English texts, particularly since it is the best way to develop orthographic knowledge. In fact, it is widely acknowledged in L1 and L2/ESL reading theory and research that the development of word recognition skills and orthographic processing skills in particular are a consequence of print exposure and experience (Adams, 1990; Eskey, 1988; Koda, 1996; Paran, 1996; Perfetti, 1991; Stanovich & West, 1989; Vellutino et al., 1994). Thus, Arab ESL learners would benefit from work in a structured reading lab (e.g., Stoller, 1986). In such an environment, ESL students could choose from a range of texts at various levels and keep track of their own progress with work on computers or graded readers. In general, some Arab ESL learners need to develop basic word recognition and identification skills, and that the best way to do this is through more extensive reading practice and exercise.

The Japanese ESL learners would also benefit from particular types of supplemental work and practice that targets the development of incremental word integration skills. One such task could involve word by word reading of sentences and short texts on the computer with materials that are suitable for the students at various levels of proficiency (e.g., appropriate vocabulary for different levels of learners). In addition, Japanese ESL students could benefit from computer tasks with ESL in visual and audio formats. Japanese ESL students with word integration difficulties should also be involved in developing listening comprehension skills that focus as much as possible on the development of more accurate word integration skills as opposed to listening for the gist or main ideas.
LEXICAL DECISION STIMULUS MATERIALS

*Consistent words:* came, date, side, more, week, time, while, like, face, past, ride, place, call, make, letter, spoke, afraid, open, mean, later

*Inconsistent words:* come, gone, move, foot, cost, listen, great, want, done, love, word, choose, watch, what, build, water, break, whom, again, some

*Pseudowords:* fird, maig, glir, nojog, naig, zirp, kisp, croux, gloph, glif, naisk, chig, parb, cown, gank, wip, tapun, fush, tays, folol

*Nonpronounceable items:* pdir, dsae, cagrh, pdelle, radf, kmoot, chpu, pmal, hrca, aidk, rpit, mili, mnoe, vdop, wospr, slbo, tkok, wliy, lvit, kper

SENTENCE READING STIMULUS MATERIALS

*High context sentences containing 12 words each*

1. The waiter in the kitchen will bring the food to the table.  
   T/F The waiter will come to the table with the food. (T)
2. The baker in the shop will sell the bread to the people.  
   T/F The baker in the shop will buy the bread from the people. (F)
3. The teacher at the desk will tell the student about the test.  
   T/F The teacher will give the student information about the test. (T)
4. The doctor in the office will call the nurse at the hospital.  
   T/F The nurse is in the office and will call the doctor. (F)
5. The student in the class will ask the teacher about the test.  
   T/F The student will talk to the teacher about the test. (T)
6. The farmer from the town will give the horse to the boy.  
   T/F The farmer will give the town a horse. (F)
7. The daughter in the city will tell her mother about the job.  
   T/F The daughter and her mother will talk about the job. (T)
8. The teacher with the book will give a pencil to the girl.  
   T/F The teacher will give a book to the girl. (F)
9. The police from the city will take the thief to the prison.  
   T/F The police and the thief will go to the prison. (F)
10. The teacher in the room will send the student to the office.  
    T/F The teacher will go to the office for the student. (F)
11. The pilot in the seat will show the plane to the children.  
    T/F The pilot will show the children the plane. (T)
12. The boy in the school will meet the teacher in the office.  
    T/F The boy in the park will meet the teacher. (F)
Low context sentences containing 12 words each

1. The lady in the office will bring the food to the party.
   T/F The lady will bring the food to the office. (F)

2. The woman at the house will sell the bread to the people.
   T/F The woman at the house will sell the bread. (T)

3. The child in the park will tell the student about the book.
   T/F The student will tell the child about the book. (F)

4. The parent in the office will call the nurse at the school.
   T/F The parent will call the nurse who is at the school. (T)

5. The woman in the street will ask the teacher about the school.
   T/F The teacher will ask the woman about the school. (F)

6. The woman from the city will give the horse to the zoo.
   T/F The woman will give the zoo a horse. (T)

7. The man in the school will call his mother at her house.
   T/F The man in the school will call his father at his house. (F)

8. The man in the street will meet the teacher in the school.
   T/F The man will meet the teacher in the school. (T)

9. The woman in the house will take the thief to the prison.
   T/F The woman and the thief will go to the house. (F)

10. The man in the store will send the student to the park.
    T/F The student will go to the park. (T)

11. The boy in the chair will show the plane to his friends.
    T/F The boy will show his friends a chair. (F)

12. The girl with the dress will give a pencil to the lady.
    T/F The girl will give the lady a pencil. (T)

ACKNOWLEDGMENTS
The research for this study was taken from part of the author’s dissertation thesis. The author greatly appreciates the guidance and support from the dissertation committee members, which included Richard Donato, Alan Juffs, Virginia Swisher, and Carol Baker. The author is also indebted to Vicki Lanier-Bergman at Spring International Language Center at the University of Arkansas in Fayetteville for her help and assistance.

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Applied Psycholinguistics 24:2 314

Fender: Word recognition and integration


