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Processing of Lexical Bundles by Persian Speaking Learners of English

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Abstract

Formulaic sequence (FS) is a general term often used to refer to various types of recurrent clusters. One particular type of FSs common in different registers is lexical bundles (LBs). This study investigated whether LBs are stored and processed as a whole in the mind of language users and whether their functional discourse type has any effect on their processing. To serve these objectives, three self-paced reading experiments were set out using the DMDX computer program. The stimuli consisted of target constituents containing LBs (discourse organizers and referential bundles) and control constituents containing non-lexical bundles (NLBs). Ninety intermediate Iranian EFL learners were selected and assigned to three groups randomly. Participants were asked to read each stimulus and answer the question that followed. The stimuli were presented word-by-word, portion-by-portion, and sentence-by-sentence in three experiments. The results showed no significant difference between LBs and NLBs in all three experiments, meaning that LBs are not stored and processed as a whole in the mind of language users. In addition, participants read referential bundles significantly faster than discourse organizers in the word-by-word experiment.

Keywords: lexical bundles, non-lexical bundles, discourse organizers, referential bundles, processing bundles

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1. Introduction

Recurrent clusters construct a substantial proportion of almost all discourse types and it is the strong tendency of any natural language to use them. As shown, at least one third to one-half of language is composed of different types of such structures (Erman & Warren, 2000; Forster, 2001; Howarth, 1998). Erman and Warren (2000) showed that 50% of spoken and written language includes such recurrent clusters. Also, the Google Web IT data base, which consists of approximately one trillion word tokens of text found on publicly accessible web pages, lists approximately 79 million formulaic sequences of five words. As corpus linguistics has demonstrated, formulacity appears in natural language and plays a significant role in the way it is acquired, processed, and used (Miller, 2010; Nattinger & DeCarrico, 1992; Peters, 1983; Wray, 2002).

FS is a general term often used to refer to various types of recurrent clusters (Schmitt, 2004; Wray, 2002, 2008). Presumably FSs are stored and retrieved holistically from the mental lexicon, which results in less workload for the speaker and listener (Erman, 2007; Pawley & Syder, 1983; Raupach, 1984; Wood, 2006). Furthermore, their proper use leads to the native-like language competence (Dufon, 1995; House, 1996) and more fluent spoken discourse (Erman, 2007; Pawley & Syder, 1983; Raupach, 1984; Wood, 2006).

FSs include various subgroups such as proverbs, lexicalized stems, clichés, and idioms. These expressions vary from completely fixed (e.g., idioms and set expressions) to more compositional (e.g., semi pre-constructed phrases, sentence builders, patterns; Wary, 2002). Formulaic language, especially fixed expressions such as idioms, has been the focus of study for several decades. However, more compositional subclasses of formulaic sequences that differ from idioms and set expressions in their structural and functional characteristics have largely been ignored in linguistic research.

One particular type of FSs common in different registers is LBs defined as the most frequently occurring sequences "of three or more words that show a statistical tendency to co-occur" (Biber & Conrad, 1999, p. 183). The Longman Grammar of Spoken and Written English (Biber, Johansson, Leech, Conrad, & Finegan, 1999) defines LBs as units that occur at least 10 times per million words in conversation and academic prose. They differ from other kinds of FSs in that (a) they have to occur at least 10 times in a million words to be classified as a bundle, (b) they are not idiomatic in meaning, (c) they do not usually represent a complete structural unit, (d) they have a fixed form, and (e) they must occur in at least five different texts to be considered as a LB.

Biber, Conrad, and Cortes (2004) classified LBs in terms of their discourse functions in English academic registers and conversation:

- stance bundles conveying interpersonal meanings, such as attitudes and assessments (e.g., *it is important to, I don't think so, I want you to*).
- discourse organizers revealing relationships between preceding and forthcoming discourse, such as topic introduction and topic elaboration (e.g., *nothing to do with, on the other hand, as well as the*).
- referential bundles performing an ideational function used to make direct reference to physical or abstract entities, such as time, place, and text references (e.g., *is one of the, in the form of, as a result of, the nature of the*).
- special conversational bundles mostly used in conversation to express politeness, inquiry, and report (e.g., *thank you very much, what are you doing, I said to him/her*).

Discourse functions differ from pragmatic functions in that the latter are highly conventionalized and salient and are used to effectively communicate certain pragmatic meanings, such as expressing requests, apologies, and gratitude. Pragmatic and discourse LBs are further distinguished from each other as the former are more interactional in nature and more context dependent. The majority of discourse LBs, however, are context-free in the sense that while a speech formula like *How do you do* is associated with greeting a person, a LB like *nothing to do with* is not related to a specific situation and can be used in a variety of contexts. In this regard, LBs that convey special conversational functions in discourse are more likely to have pragmatic functions (Coulmas, 1979, 1981).

2. Review of Literature

Studies conducted on LBs have mainly focused on their identification and patterns of occurrence in English L1 written academic prose and conversations (Biber & Conrad, 1999; Biber, Johansson, Leech, Conrad, & Finegan, 1999; Biber et al., 2004), and little has been done on their processing and their mental representation. As LBs are defined as recurrent word combinations, it is logical to assume that they are stored and retrieved as holistic units (Biber et al., 1999; Bybee and Hopper, 2001; Ellis, 1996). Some studies have explored the processing of LBs as part of multi-word units or formulaic sequence stimuli (Arnon & Snider, 2010; Bannard & Matthews, 2008; Bod, 2001; Conklin & van Heuven, 2011; Ellis & Simpson-Vlach, 2009; Shcmitt, Grandage, and Adolphs, 2004; Siyanova-Chanturia, Siyanova & Schmitt, 2008).

Others have investigated processing of LBs by the native speakers (Schmitt 2004; Schmitt 2005; Schmitt & Underwood, 2004; Tremblay, 2009; Tremblay & Baayen, 2010; Tremblay Derwing, Libben & Westbury, 2011; Underwood, Schmitt, and Galpin; 2004). Few researchers focused on the processing of LBs by Persian-English learners and compared the results with the results of studies on native-English speakers and other L2 English learners to find out whether they are processed as whole units, considering the fact that learners have less exposure to the language in a real context. The following sections briefly outline the studies conducted to compare the processing of LBs by native and non-native speakers of English except Persian-English learners.

Jiang and Nekrasova (2007) found that native and non-native speakers of English responded to three-word lexical bundles faster and more accurately than non-lexical bundles in two on-line grammaticality judgment tasks. These results provide evidence for the idea that formulaic sequences (including high-frequency three-word sentences) are stored and processed holistically.

Nekrosova (2009) investigated the use of LBs by L1 and L2 speakers of English in a controlled (i.e., gap-filling) as well as an extended production task (i.e., timed dictation). The researcher chose 32 four-lexical bundles homogenized in terms of frequency counts. The selected LBs served discourse-organizing and referential functions. It was expected that L1 speakers show greater knowledge of LBs than lower proficiency L2 learners and produce these units differently based on the function performed by them in context. Confirming the expectation, advanced and native English speakers showed no difference in the knowledge of target structures while intermediate L2 learners showed significantly lower scores. Therefore the researcher concluded that there is a positive relationship between the production of LBs and proficiency level of L2 learners. Finally, all groups displayed greater familiarity with discourse-organizing than referential bundles.

Columbus (2012) studied the processing of three groups of multi-word units (idioms, restricted collocations, LBs) by native and nonnative speakers in an eye-movement paradigm. Analysis of data during normal sentence and trigram reading suggested a similar processing framework in both groups affected by the frequency of multi-word units.

As reviewed above, no study has investigated the processing of LBs as a specific type of FSs by Persian-English learners. Also, the task used in the present study is what makes it different from the previous ones. The present study adopts three self-paced reading experiments to explore the processing of LBs in a different context to find out whether LBs are represented as holistic units and whether LBs are processed differently when achieving different functions in discourse. As a result, the following questions were addressed in the present study:

1. Is there any significant difference between reading times for LBs and NLBs in a word-by-word, portion-by-portion and sentence-by-sentence self-paced L2 reading task?
2. Does the type of discourse function have any significant effect on reading times of LBs in L2?

2. Method

Three self-paced reading experiments were conducted to explore mental representation of LBs in Iranian EFL learners. This method modeled after Tremblay et al. (2011), who investigated the processing of LBs by native speakers through a word-by-word, portion-by-portion, and sentence-by-sentence self-paced reading experiment.

2.1 Participants

Ninety Persian learners of English were selected out of a pool of 150. All the participants were undergraduate students of TEFL at Islamic Azad University, Najaf Abad branch. They had been in a Persian speaking environment from birth; however, they received formal instruction in English at high school, university, and language institutes. Moreover, they had no exposure to English in natural settings. Insofar as their proficiency level is concerned, they had an IELTS (academic module) overall band score of 5, and, therefore, were considered as modest users. They took the test at the Islamic Azad University, Najafabad Branch in 2010. The participants were randomly assigned to 3 groups of 30 each to take part in the word-by-word, portion-by-portion, and whole sentence experiment.

2.2 Stimuli and design

Ten four-word strings classified as discourse-organizer bundles and 10 four-word strings sorted as referential bundles were taken from Biber et al. (1999, pp. 992-993; Appendix A). The frequency of each string was checked against the Corpus of Contemporary American English (COCA). COCA is the largest freely available corpus of English and contains more than 450 million words of text and is equally divided among spoken, fiction, popular magazines, newspapers, and academic texts.

Following Biber et al. (1999), an attempt was made to assure that each bundle had a frequency of occurrence of at least ten times per million words in order to be considered as a LB. Twenty NLBs were constructed by replacing one word in each LB string with another word of relatively similar length (in terms of number of letters) and frequency, as these two factors appear to influence the speed of word recognition (Appendix A). MRC psycholinguistic database (Cullings, 1988) was used for this purpose. In fact, each NLB differed from the target LB by just one word, referred to as the pivot word (PW). Plausibility and frequency of occurrence of NLBs were controlled to be well below 10 times per million words on the basis of COCA. In order to control for the relevant features of LBs and NLBs and homogenize them in terms of features found influencing on their processing in previous studies, a series of *t*-tests was used. Table 1 shows the results.

Table 1. Features of stimuli and relevant t tests across LBs and NLBs

Measure	LB			NLB			Difference	*t*
	Min	Max	Mean	Min	Max	Mean		
Pivot Word length	3.00	6.00	4.2500	2.00	6.00	4.0500	38	.662
4- Word strings length	10.00	15.00	12.1000	9.00	15.00	11.8500	38	.486
Pivot Word (Frequency per million words)	109.00	3941.00	1106.0500	60.00	10099.00	1140.9000	38	-.060
4- Word strings (Frequency per million words)	16.85	667.93	262.9685	.00	7.04	2.1065	38	5.749

Each target LB and its control NLB were embedded in an appropriate sentence by a native English speaker, and the control NLB sentences differed from the target LB sentences by only one PW. In all cases, the LB and NLB strings were embedded after the fourth word of the sentence and were followed by four more words. The length of each sentence was 12 words. We made an effort to control the frequency of the portions occurring before and after the target and control strings so that they would not have frequency equal to or higher than ten per million, being the accepted criterion for the LB status.

A simple yes/no question was used after each sentence to ensure that participants actually read and processed the materials. It was impossible for them to answer the question without processing and understanding the target sentence including either a LB or a NLB. Furthermore, only those who answered the questions correctly were included in data analysis. Finally, 2 counter-balanced lists were created. List A included 10 randomly selected sentences containing 10 LBs of the original 20 target LB and the other 10 sentences containing 10 control NLBs with their own questions. List B consisted of their counterparts. In short, a LB sentence and its counterpart NLB sentence appeared in 2 separate lists. For example, when *'Please enter the island if you have a safe place to stay.'* appeared in list A, *'Please enter* *the island if you own a safe place to stay.'* showed up in list B. This counter balancing served to avoid repetition effect.

2.1 Procedure

In the first experiment, participants were tested individually. They received oral instructions on what to do during the experiment. They were asked to read each sentence on a PC screen and answer the question that follows. Each trial consisted of the following sequence: First, the sentence "when you are ready, click the spacebar" was displayed. As they pressed the key, they could see the first stimulus being the first word of the first sentence from list A.

After reading the first word, they had to press the key to remove the word and to see the next. This step was repeated for all the remaining words in the sentence. After the last word, they saw 3 asterisks on the screen for 1000 ms followed by a question. Finally, they were asked to answer the question by using “right shift” for “yes” and “left shift” for “no”. Once they pressed the “yes” or “no” button, the next trial (next sentence) started. Reading times were saved and measured from the onset of stimuli to the y/n key pressing. When they finished list A, after 10-15 minutes, they had to work on list B. Prior to the experimental trials, each participant had to work on 3 practice sentences to become familiar with the task. It was necessary for them not to learn that their knowledge of LBs would play any role in the experiment.

Since word-by-word reading seems to be unnatural and rarely occurs in everyday life, the second experiment was set out to compare LBs with NLBs through a more naturalistic reading experiment. Thirty participants with the same proficiency level as those in experiment 1 were assigned to this experiment. The stimuli and the procedure resembled the first experiment except that, following Tremblay et al. (2011), the stimuli were presented portion-by-portion not word-by-word. Each sentence was divided into 3 portions: (a) portion one containing everything occurring before the target/control string, (b) portion two including the target/control string, and (c) portion three embracing the remaining parts. Only the reaction time for portion 2 was considered for analysis.

In the third experiment, sentence-by-sentence presentation was used to test the same issue in a more natural context. Thirty participants not taking part in the first two experiments and having the same features as the participants in experiments 1 and 2 were recruited. The stimuli and the procedure resembled the first two experiments except the presentation of stimuli that was whole sentences.

2.2 Apparatus

DMDX program designed to precisely measure reaction times of the stimuli with millisecond accuracy (Forster & Forster, 2003) and available for free download (http://www.u.arizona.edu/n kforster/dmdx/dmdx.htm) was used to collect data.

3. Results

Experiment 1(word by word task): in order to analyze data, the first step was to exclude incorrect responses, which included 14.3% of the data and trials with RTs slower than 6000 ms and faster than 115 ms., which included 2.25% of data. For analysis by subjects (*F1*) and by items (*F2*), general linear repeated measures with lexicality and type as the independent variables and RT as the dependent variable were used respectively. Table 2 shows the descriptive statistics related to experiment 1.

Table 2. Descriptive statistics related to experiment 1

Measure: MEASURE_1

				95% Confidence Interval	
lex	type	Mean	Std. Error	Lower Bound	Upper Bound
LB	disccourse	1749.567	72.813	1600.647	1898.487
	referential	1623.777	59.828	1501.415	1746.139
NLB	disccourse	1810.902	76.623	1654.191	1967.613
	referential	1607.983	55.036	1495.422	1720.544

Descriptive statistics show differences among the mean; however, inferential statistics showed no difference between the processing of LBs vs. NLBs, *F1*<1 and *F2*<1. Referential markers, nonetheless, were processed faster than discourse markers in both LBs and NLBs, *F1* (1, 29) = 10.00, $p < .01$, MS= 81018.4, partial eta squared = .26 and *F2* (1,36)=7.71, $p<.01$, MS=

35731.9, eta square = .18. Furthermore, no interaction between lexicality and type was observed, *F1* (1, 29) = 1.41, *p* >.01, and *F2*<1. Table 3 shows the inferential statistics.

Table 3. General linear repeated measures for experiment 1

Effect		Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
lex	Pillai's Trace	.018	.517[b]	1.000	29.000	.478	.018
	Wilks' Lambda	.982	.517[b]	1.000	29.000	.478	.018
	Hotelling's Trace	.018	.517[b]	1.000	29.000	.478	.018
	Roy's Largest Root	.018	.517[b]	1.000	29.000	.478	.018
type	Pillai's Trace	.256	10.002[b]	1.000	29.000	.004	.256
	Wilks' Lambda	.744	10.002[b]	1.000	29.000	.004	.256
	Hotelling's Trace	.345	10.002[b]	1.000	29.000	.004	.256
	Roy's Largest Root	.345	10.002[b]	1.000	29.000	.004	.256
lex * type	Pillai's Trace	.046	1.413[b]	1.000	29.000	.244	.046
	Wilks' Lambda	.954	1.413[b]	1.000	29.000	.244	.046
	Hotelling's Trace	.049	1.413[b]	1.000	29.000	.244	.046
	Roy's Largest Root	.049	1.413[b]	1.000	29.000	.244	.046

b. Exact statistic

Experiment 2 (portion-by-portion task): prior to the analysis, participants, who made 12.7% errors, trials with RTs slower than 9757 ms and faster than 170 ms, which included 2.16% of data, were excluded from the analysis. As in experiment 1, lexicality and type were considered as independent and RT as dependent variables. Table 4 shows the descriptive statistics.

Table 4. Descriptive statistics for experiment 2

Measure: MEASURE_1

lex	type	Mean	Std. Error	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
1	1	1781.735	98.455	1580.371	1983.098
	2	1623.071	107.809	1402.578	1843.565
2	1	1814.559	76.936	1657.206	1971.911
	2	1705.294	66.689	1568.899	1841.689

General linear repeated measures showed no significant effect of lexicality, type, and the interaction between the two, *F1*(1,29) = 0.63, *p* >.01, MS= 1779100.63, *F2* = <1 ; *F1*(1,29) = 3.14 , *p* >.01, MS= 2570930.23, *F2* = <1;

and $F1(1,29) = 0.13$, $p > .01$, MS= 1195708.85 , $F2 = <1$ respectively. Table 5 shows the same information.

Table 5. General linear repeated measures for experiment 2

Effect		Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
lex	Pillai's Trace	.021	.627[b]	1.000	29.000	.435	.021
	Wilks' Lambda	.979	.627[b]	1.000	29.000	.435	.021
	Hotelling's Trace	.022	.627[b]	1.000	29.000	.435	.021
	Roy's Largest Root	.022	.627[b]	1.000	29.000	.435	.021
type	Pillai's Trace	.098	3.145[b]	1.000	29.000	.087	.098
	Wilks' Lambda	.902	3.145[b]	1.000	29.000	.087	.098
	Hotelling's Trace	.108	3.145[b]	1.000	29.000	.087	.098
	Roy's Largest Root	.108	3.145[b]	1.000	29.000	.087	.098
lex * type	Pillai's Trace	.005	.131[b]	1.000	29.000	.720	.005
	Wilks' Lambda	.995	.131[b]	1.000	29.000	.720	.005
	Hotelling's Trace	.005	.131[b]	1.000	29.000	.720	.005
	Roy's Largest Root	.005	.131[b]	1.000	29.000	.720	.005

b. Exact statistic

Experiment 3 (sentence by sentence task): in the same line with the previous steps of data analysis, incorrect responses, which included 12% of the data, and trials with RTs slower than 94347.52 ms and faster than 200 ms, which included 2.5% of data, were excluded from the analysis. Then descriptive statistics were calculated and presented in Table 6.

Table 6. Descriptive statistics for experiment 3

Measure: MEASURE_1

lex	type	Mean	Std. Error	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
1	1	9916.309	737.313	8408.334	11424.283
	2	9606.747	640.896	8295.967	10917.527
2	1	9573.481	1315.121	6883.756	12263.206
	2	10561.717	616.728	9300.366	11823.068

General linear repeated measures showed no effect of lexicality, $F1(1,29) = 3.11$, $p > .01$, MS= 1606282.3, $F2<1$; type, $F1(1,29) = 1.61$, MS= 3863570.73, $F2<1$; and the interaction between the two, $F1<1$, and $F2<1$. Table 7 includes the results.

Table 7. General linear repeated measures for experiment 3

Effect		Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
lex	Pillai's Trace	.005	.156[b]	1.000	29.000	.696	.005
	Wilks' Lambda	.995	.156[b]	1.000	29.000	.696	.005
	Hotelling's Trace	.005	.156[b]	1.000	29.000	.696	.005
	Roy's Largest Root	.005	.156[b]	1.000	29.000	.696	.005
type	Pillai's Trace	.012	.349[b]	1.000	29.000	.559	.012
	Wilks' Lambda	.988	.349[b]	1.000	29.000	.559	.012
	Hotelling's Trace	.012	.349[b]	1.000	29.000	.559	.012
	Roy's Largest Root	.012	.349[b]	1.000	29.000	.559	.012
lex * type	Pillai's Trace	.026	.761[b]	1.000	29.000	.390	.026
	Wilks' Lambda	.974	.761[b]	1.000	29.000	.390	.026
	Hotelling's Trace	.026	.761[b]	1.000	29.000	.390	.026
	Roy's Largest Root	.026	.761[b]	1.000	29.000	.390	.026

b. Exact statistic

4. Discussion and Conclusion

This study examined whether four-word LBs were stored and processed holistically in the mind of Iranian EFL learners and whether the type of LB (being discourse organizer of referential) influenced the processing time. To achieve these goals, three groups of intermediate EFL learners were assigned 3 self-paced reading tasks on LBs and NLBs, and their reaction times were measured and analyzed.

The results of data analyses on LBs and NLBs showed no difference between the reading times in word by word, portion-by-portion and sentence by sentence tasks meaning that LBs are not processed holistically in the mind of EFL learners. These findings are in contrast with results obtained by some studies aimed at determining whether FSs (Bod, 2001; Bogdanovich, Sykes, & Barr, 1997; Conklin & Schmitt, 2007; Ellis & Simpson-Vlach, 2009; Gibbs, Ortony, Schallert, Reynolds, & Antos, 1978; Siyanova-Chanturia, Conklin & Schmitt, 2011; Underwood et al., 2004) and particularly LBs (Columbus, 2012; Jiang & Nekrasova, 2007; Nekrosova, 2009; Tremblay et al., 2011) are stored and processed holistically by native and nonnative speakers. On the other hand, results are consistent with a few studies that failed to find processing discrepancies between formulaic and non-formulaic sequences. For example, similar to the first experiment, Schmitt and Underwood (2004) did not find any difference between processing of terminal words in formulaic sequences vs. the same words in non-formulaic contexts in a one-by-one presentation of words in a self-paced reading experiment in both L1 and L2. The same conclusion is reported by Shcmitt et al (2004). They selected 25 sentences from previous publications and embedded them in a text to be used in an oral dictation task. Both native and non-native participants listened to the recorded text and orally repeated it sentence -by-sentence within a limited time period. The text included sequences such as 'I see what you see'. Fluency and accuracy of the performances was an indicator of holistic representation of the items. However, the results fail to support the holistic representation of most structures for both native and nonnative speakers.

No difference has been found between the processing of LBs and NLBs. This fining can be explained by reference to the issue that the L2 participants of the present study were unaware of L2 recurrent clusters due to their low level of proficiency. This view is also supported by Wray (2002) and Lewis (1993), who believe in the difficulty of L2 speakers in mastering accurate and appropriate use of FSs. Furthermore, De Cock (2000) and De Cock, Granger, Leech, & McEnery (1998) indicated that use of recurrent phrases in L1 was different both quantitatively and qualitatively from L2. L2 speakers, who are unaware of the more common, yet less salient L2 chunks, have been shown to refer to L1 in order to compensate for their lack of awareness.

The findings can be interpreted in terms of “regularity hypothesis” (Tremblay, 2009), according to which "linguistic units that can be composed from less complex units in accordance to regular rules are not stored as ready-made chunks." (p.2). On the whole, it seems that low proficiency L2 learners living in L1 setting cannot enjoy the same type of native LBs processing. However, since the data in this study have been taken from a small sample of learners at one university in Iran, any generalization should be made with care.

Considering the last research question, referential bundles were read more quickly than discourse bundles in experiment 1. This finding seems to be in contrast with Nekrasova (2009), who compared the knowledge of native and nonnative speakers of LBs serving different functions in a gap-filling and a dictation task. Participants did better on discourse organizers than referential bundles. Therefore, the author argued that discourse organizer bundles, which introduce new topics, have a more important role for the overall comprehension. As a result, they are noticed and acquired sooner. In comparison, referential bundles, which refer to something concrete or abstract in order to highlight it or to point out a particular attribute, operate at a lower level in a text and hence are acquired later. Yet, in the present study, the processing advantage emerged in favor of referential bundles. A possible reason may be the dependence of participants on bottom-up reading strategies being the common feature of the beginning L2 readers. Because of this, discourse bundles operating at higher text levels were processed more slowly by them, especially as the findings of experiments 2 and 3 failed to show the advantage of referential over discourse organizer bundles.

In experiment 2 and 3, where participants read the stimuli portion-by-portion and sentence by sentence, no significant difference between discourse organizers and referential bundles was found. It appears that presenting the stimuli in portion-by-portion and sentence-by-sentence distorted processing referential bundles as holistic units. Future studies may investigate if this effect would be observed in other settings or for higher proficiency participants and possible reasons for this issue.

The findings of this study may have some pedagogical implications. Based on the literature on the topic, there is a general consensus among cognitive linguists (Langacker, 1987), psycholinguists (Wray, 2002), corpus linguists (Biber et al., 2004; Cortes, 2006) and educational linguists on the importance of LBs in language learning. They believe that native-like competence in L2 cannot be achieved without the knowledge of a great many of them. As there is neither enough processing time nor processing space for applying discrete grammar rules while reading, writing, speaking, and listening, knowledge of LBs can help language users by providing ready-made language that meets their expectations without the demanding need for their processing.

The present study suggests several directions for future research. Measuring reaction times in a self-paced reading task might not be direct enough for detecting processing differences between LBs and NLBs.

Adapting other tasks and techniques such as online grammatically judgment, dictation and eye tracking may bring about different results. Furthermore, it is worth including other independent variables such as age, gender, and frequency in future studies.

Note of Caution

This article has gone through a change in the name of the second and third authors as of 8/1/2023. The responsibility for this unacknowledged forgery in those names in the earlier version rests upon the first author of the article. As nearly 7 years have passed since the initial publication of this manuscript, the journal editors decided not to retract it from the site as the truth has come to life and the two rightful authors have every right to have the article published under their names.

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