Structure of the second language mental lexicon: how does it compare to native speakers’ lexical organization?

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One of the questions frequently asked in second language (L2) lexical research is how L2 learners’ patterns of lexical organization compare to those of native speakers (NSs). A growing body of research addresses this question by using word association (WA) tests. However, little research has been done on the role of language proficiency in the associative patterning of L2 learners’ lexical knowledge, especially the way it affects the quantitative and the qualitative patterns of meaning connections. Similarly, no research attention has been devoted to the strength of the relationship between these patterns, although the general assumption seems to be that they are interrelated. To address these issues, first some traditional distinctions that first language (L1) WA researchers make between the qualitative and quantitative features of WA domains are discussed. Next, the application of WA tests in L2 studies and some of the most significant findings concerning L2 learners’ vocabulary structure are briefly reviewed. Finally, a study involving native speakers (n = 29), L2 advanced (n = 29) and L2 intermediate learners of English (n = 29) is presented. Results suggest that differences in the organization of lexical knowledge between L2 speakers and NSs are quantitative rather than qualitative.

I Introduction

The use of word association (WA) tests in first language (L1) psychological research has a long tradition, but has only fairly recently been
employed in second language (L2) lexical studies. The cognitive approach to the analysis of WAs has attracted the attention of several L2 researchers (e.g. Miron and Wolfe, 1964; Lambert, 1972; Meara, 1978), whose early experimental work paralleled to a large extent L1 associative research. These researchers broadened the scope of L1 studies by adding questions concerning the way L2 learners’ associative behaviour compared to native speakers’ (NSs’) associative patterns. Their main point of departure was the finding that adult NSs tend to show stable patterns of associative organization of meaning connections along commonly shared paradigmatic–syntagmatic patterns. By contrast, L2 researchers consistently found that L2 learners failed to develop such stability in their lexical connections.

The aim of the present study is to pursue this line of enquiry. First, the theoretical framework underlying the use of WA tests in lexical research as developed and used in L1 psychological and cognitive research is reviewed. I focus on some traditional distinctions L1 researchers make between qualitative and quantitative features of WA domains which, unfortunately, are frequently not taken into account in L2 WA research. Next, I give a brief overview of the application of WA tests in L2 experimental work and some of the most significant findings concerning L2 learners’ vocabulary structure. Finally, I present a study that addresses under-researched questions aimed at shedding light on issues related to the organization of the L2 mental lexicon and its qualitative and quantitative features.

II L1 word association research

Most of the assumptions behind using WA tests in L1 research derived from the notion that language associative behaviour could be revealing of the cognitive processes of human thought. Cognitive psychologists from this tradition (e.g. Cramer, 1968) believed that associative responses to stimulus words (SWs) reflect the functioning of thought processes of an individual. Consequently, it was widely believed that understanding these simpler units of thought could help in understanding the more complex processes of thinking (Cramer, 1968: 6). Within the same tradition of WA research, Deese (1965) took this idea a step further by arguing that by studying individuals’ associative responses, researchers
could get insights not only into the processes of thinking but also into the way individuals construct their sets of meaning. He also contended that it is the very nature of meaning as a relational concept that makes it possible to account for certain relationships between words and natural phenomena as well as between words and other words.

The organization of the WA domain has been traditionally described in L1 research by means of quantitative and qualitative measures. Quantitative measures, such as the strength of the primary response, response commonality, response heterogeneity, response idiosyncrasy, availability of responses, number of responses, etc., have mostly been used as indicators of the quantitative characteristics of the organization of the associative domain and have been measured in terms of number of associations that point to these features. The qualitative measures – such as the form classification of the responses (paradigmatic and syntagmatic), the semantic classification (e.g. synonyms, antonyms, meronyms, etc.) of the associations, etc. – have been applied to describing the qualitative characteristics of language users’ WA domains and have been traditionally reported in terms of proportions (for more detail, see Cramer, 1968).

Following this distinction, early psychological experiments discovered that there was a high degree of commonality of the primary and secondary responses language users produce despite individual differences in their experience and background. This finding gave rise to a large number of studies that began analysing the degree of commonality of associative responses among various groups of individuals. In addition, Deese (1965) noted that one of the unique features of human

1A primary response is usually defined as a response that occurs with the greatest frequency to a given SW. As a measure of associative strength, it can be used either in a dichotomous fashion – that is, to indicate whether a SW elicits or does not elicit a primary response – or it may be used to indicate the actual frequency of occurrence of a primary response. A measure allied to the primary response strength is that of response commonality. The idea of response commonality is most often used to refer to the frequency of occurrence of any three most commonly given associations to a SW determined in terms of their absolute frequency of occurrence in a WA data set. In addition to measures of response strength, researchers noticed that different SWs elicit varying numbers of associations, hence, to study the size of the associative domain they started employing measures such as total number of responses a SW can elicit from a group of participants or availability of responses. Finally, closely linked to the size of the associative domain are measures indicating the heterogeneity of the domain, such as number of different responses generated to any SW or response idiosyncrasy; that is, a measure which captures original responses given by only one participant, thus occurring only once in a dataset (for greater detail, see Cramer, 1968).
language relates to the highly organized relationships between words in language. Consequently, he held that the best way of studying relations among meanings of words was to adopt a semantic approach to the analysis of WAs. In the main, such understanding of semantic relationships among words in the mental lexicon is very much in concert with current semantic field theory. By and large, semantic field theory advances the idea that the meanings of words must be understood in relation to other words that shape a given semantic domain (Kittay & Lehrer, 1992). Thus, to understand the meaning of the noun scent, for example, one has to understand first its contrastive relation to other nouns such as odor, aroma, stink; its affinitive relation to the word smell, as well as its syntagmatic relations to words such as unpleasant, delightful, give off, detect, etc. Overall, researchers from the semantic field tradition agree that the relations which order a field are of two types: paradigmatic, words that are substitutable for one another in a well-formed syntactic string (e.g. synonyms, antonyms, meronyms, hyponyms, etc.), and syntagmatic, words that collocate well in a grammatical string and have semantic affinities (e.g. something gives off a bad smell but cannot emanate or excrete it) (Kittay & Lehrer, 1992).

However, many WA researchers (e.g. Ervin, 1961; Deese, 1965; Stolz & Tiffany, 1972) took a broader view on the nature of associative relations between words by adopting a distinction between paradigmatic and syntagmatic relations based on lexical class rather than on semantic relations alone. According to this broader categorization of responses, paradigmatic responses are the ones that belong to the same lexical category as the stimulus word (SW) and syntagmatic responses are those that belong to a different lexical class than the SW. This approach is broader than the semantic field view in that it supports the linguistic assumption that members of a given lexical category can replace one another in a wide variety of sentences, i.e. they can potentially occupy equivalent positions within utterances. By contrast, stimulus-response members of different lexical categories usually occupy different positions within phrases and sentences and, more often than not, tend to be contiguous. In this regard, as Deese (1965: 100) pointed out, a positional-equivalence notion of a lexical class is ‘a psychologically useful one’ because it reflects certain important features in concept attainment. In the main, the broad distinction between paradigmatic and syntagmatic
associations, though not unanimously agreed upon, further emphasizes the difficulty of drawing a clear dividing line between syntax and meaning, despite their relative independence. The reason being that ‘both are structured within the language and both have extralinguistic referents . . . The only possible difference between grammar and meaning is that meaning is more influenced in its structure by extralinguistic relations (relations in the natural world), but grammar is, to a lesser extent, so structured (by, for example, social relations), so the distinction is one of degree rather than an absolute one’ (Deese, 1965: 100–01).

III Word association tests in L2 research

Research on the associative behaviour of L2 learners has been a subject of interest in L2 studies for several decades now. As a matter of fact, the early L2 studies closely paralleled L1 WA research in the approaches used to the analysis of association data; however, the questions asked by L2 researchers are somewhat different from the ones asked by L1 researchers. While a L1 WA study would aim primarily at examining certain aspects of the organization of lexical knowledge of NSs of a language, L2 researchers use WA tests to probe the L2 lexicon from different angles in comparing it to the NSs’ lexicon. Broadly speaking, we can distinguish several relatively distinct lines of L2 WA research, which differ mainly in the perspective from which L2 association patterns are discussed. For example, WA tests have been interpreted:

• from a socio-cultural perspective;
• from the point of view of language proficiency and its effects on associative behaviour;
• as an indicator of “depth” (or quality) of vocabulary knowledge; and
• as an indicator of the organization of the L2 mental lexicon.

It should be pointed out that each of these lines makes a valuable contribution to our understanding of the relationship between associative behaviour (as revealing of the way L2 users organize their meaning connections) and the factors that influence this organization. The socio-cultural perspective, for example, has greatly contributed to our
understanding of the complexities involved in the attainment of lexical concepts by L2 learners. In the main, the conclusions drawn by researchers working in this paradigm strongly emphasize the subtle interaction and the inextricable relationship between language and culture, which projects itself in the acquisition of new vocabulary and its organization. On the other hand, researchers who have been interested in the relationship between associative patterns and language proficiency have used WA tests in their studies to find out whether they are suitable for measuring language proficiency (e.g. Kruse et al., 1987). Some of the early research in this direction (e.g. Riegel et al., 1967; Kolers, 1963; Davis and Wertheimer, 1967; Lambert, 1972) revealed that the number of responses given to SWs increased with an increase in language proficiency, confirming a relationship between the number of meaning connections and proficiency level. However, the degree of commonality between responses was found to be largely unaffected by changes in the number of associations L2 learners could generate to SWs. In addition, some researchers observed that the lower proficiency groups tended to translate the stimuli (e.g. Davis & Wertheimer, 1967) or to give more often directly translated responses to concrete than to abstract stimuli (e.g. Kolers, 1963; Meara, 1978). Overall, the studies that attempted to determine whether WA tests can be used as a sensitive predictor of language proficiency are far from being in agreement about their potential. Some researchers (e.g. Kruse et al., 1987) have concluded that WA tests do not show much promise as a means of assessing proficiency, whereas others (e.g. Piper & Leicester, 1980) have argued that WA behaviour is sensitive to language proficiency. The contradictory conclusions of these studies are largely due to certain methodological weaknesses, such as methods of assessment of general proficiency and word familiarity, methods of SW selection, scoring procedures, etc. Nonetheless, Wolter (2002) has suggested on an optimistic note that refinement of scoring procedures in addition to careful consideration of proficiency assessment and SW selection may yield testing procedures valid for distinguishing more proficient from less proficient L2 learners.

Most recently, attempts have been made (e.g. Meara, 1978; Read, 1993; Greidanus and Nienhuis, 2001; Vermeer, 2001; Wolter, 2001) to examine quality, or “depth”, of word knowledge by employing association tests as a means of tapping L2 learners’ meaning representations.
Typically, researchers from this paradigm seem to share a common belief that WA tests are a valuable tool for assessment of the structure of lexical knowledge, although they differ vastly in their interpretation of the association patterns. Some researchers (e.g. Kruse et al., 1987; Schmitt, 1998; Wolter, 2002) see the value of WAs test as a useful instrument to measure L2 learners’ ability to produce nativelike associations. Based on the response commonality of his norm group, Schmitt (1998), for example, argued that the attribute on which quality of L2 responses should be judged is the degree of native-likeness of L2 associations. In his analysis, the high degree of commonality among NSs’ responses was an indicator of native-likeness of association behaviour against which L2 learners’ associations should be matched. Hence, a higher degree of native-likeness of L2 associations will be indicative of a higher quality of lexical knowledge. Another group of researchers (e.g. Read, 1993; Wolter, 2001; Wilks and Meara, 2002; Meara and Wolter, 2004; Wilks et al., forthcoming) seem to favour Meara’s proposal (1978; 1984; 1996) of looking at lexico-syntactic patterns of association responses as characteristic of language users’ organization of lexical knowledge. He also hints at the possibility that when L2 learners develop vocabularies that are sufficiently large in size, it is the organization of that knowledge that becomes of primary importance (Meara, 1996). In his view, it is essential to know whether L2 learners’ lexical knowledge is organized in connections similar to those of NSs or whether they simply tag L2 words in their L1 lexicons. Researchers supporting this view base their analyses on the assumption that the paradigmatic, syntagmatic, and phonological patterns of associations are revealing of different types of meaning relationships between words in the mental representations of language users (for a review, see Clark, 1970).

The results of past studies point to the broad conclusion that L2 learners’ patterns of lexical connections are different from the those of NSs, although it should be noted that little attention has been paid to identifying the nature of these differences, i.e. whether they concern quantitative patterns, qualitative patterns or both. More specifically, no attempt has been made to compare quantitative and qualitative patterns with regard to the effects of increased proficiency. To clarify the issues, the present study adopts the distinction made in L1 WA research whereby quantitative features are described in terms of number of
associations determining the size, commonality and heterogeneity of the associative domain, while qualitative features are described in terms of proportions of paradigmatic, syntagmatic and phonological associations. The analysis of these features will try to answer several important questions concerning the organization of the L2 mental lexicon:

- Where should the differences between NSs’ and L2 learners’ mental lexical structure be looked for?
- How does an increase in language proficiency affect the organization of L2 learners’ lexical knowledge?
- Do the quantitative and the qualitative features of the mental lexicon interact?
- Which set of features is more sensitive to an increase in language proficiency?
- Do WA tests have potential for use as assessment tools?

IV The study

In an attempt to answer these questions in an empirical way, first the quantitative characteristics of the WA domains of three groups of participants (NSs, L2 advanced and L2 intermediate learners) are compared. Three quantitative features are analysed by means of one measure corresponding to each of the features:

- associative strength is measured by response commonality;
- size of the associative domain is measured by total number of responses;
- heterogeneity of the response domain is measured by number of different responses.

Next, WAs are examined with regard to their qualitative patterns, i.e.:

- proportion of paradigmatic;
- proportion of syntagmatic; and
- proportion of phonological associations.

Finally, the qualitative and the quantitative characteristics of the WA domains of the three groups are compared in an attempt to examine the
strength of the relationship between them. The following hypotheses are tested in the experiment:

• There are differences in the quantitative features of the mental lexicons of NS, advanced L2 learners and intermediate L2 learners of English for the words that they know, measured by participants’ total number of WAs; within-group response commonality; and number of different responses.

• There are differences in the qualitative features of the mental lexicons of NS, advanced L2 learners, and intermediate L2 learners of English for familiar words, measured by participants’ proportion of (1) paradigmatic, (2) syntagmatic, and (3) phonological WA responses.

• The quantitative and the qualitative features of participants’ lexical organization are interrelated.

1 Participants

Eighty-seven adults, both NSs and L2 learners of English, participated in the study. The NSs ($n = 29$), both male ($n = 9$) and female ($n = 20$), were undergraduate students enrolled in an introductory course in linguistics at a US university. The L2 learners of English were also adults, male ($n = 19$) and female ($n = 39$) of different L1 backgrounds, attending an ESL Program or university courses at two US universities, as well as EFL certificate preparation courses in Europe. The L2 participants were devided into two groups according to their proficiency level: an advanced learner group ($n = 29$) and an intermediate learner group ($n = 29$). The participants were placed into the two proficiency groups based on three tests: the Cambridge Certificate in Advanced English (CAE) for the advanced learners, Cambridge First Certificate of English (FCE) for the intermediate learners, and TOEFL for both groups. The first two tests are regularly used by the EFL institution to assess the progress of the students attending their certificate preparation classes. Only the scores on the Reading and Use of English sections of the CAE and FCE were considered in the placement, with a lowest passing grade of D (60% of correct answers) on both sections. So, for the advanced learners, the CAE mean was 76.4% and for the intermediate group the FCE mean was 64.4%. The participants who were
placed in the L2 advanced group based on TOEFL had an official score mean of 581 (paper-based format) and $M = 259$ (computer-based format$^2$); the participants placed in the intermediate learner group had a mean paper-based TOEFL score of 429. All proficiency tests were taken in controlled settings.

2 Materials and procedure

The participants completed in writing a vocabulary test containing 73 SWs selected from a learner’s dictionary (Hornby, 1978) by means of systematic sampling with a random start. The procedure, also known as a spaced sampling procedure, is commonly employed by L1 (e.g. Anglin, 1993; Johnson and Anglin, 1995) as well as L2 lexical researchers (e.g. Goulden et al., 1990) and involves selecting lexical items at a specific interval from a randomly determined starting point in a dictionary. The sampling interval in this study took every first new boldface main entry from every 20th column, starting from the right-hand column on the first page of the dictionary, and resulted in a list of 73 words included in the test instrument (for a detailed description of the sampling procedure see Zareva et al., 2005).

Even though this procedure of SW selection does not go unchallenged, the underlying motivation behind using systematic sampling as a method of test item selection was to produce a sample of words that would meaningfully reflect the lexicon of educated adults, both NSs and non-NSs (NNSs) of English, in terms of representation of different lexical categories, from a broad range of lexical usage (including specialized vocabulary, foreign words, formal and informal usage, old and current usage, technical words, etc.) and a wide range of word frequencies. It was also an attempt to create a sample that, on the one hand, would be close to word occurrences in natural language (i.e. as close as a selection from a dictionary allows) and, on the other hand, would describe the lexicon of the participants in terms that resemble the ones most educated people would use when referring to the content of their vocabularies. Finally, by

$^2$Based on the concordance tables developed by the TOEFL program to facilitate score comparability, a mean of 259 points on a computer-based format roughly corresponds to 615 points on a paper-based test.
using a spaced sampling procedure for SW selection, an effort was made to overcome some of the problems associated with selecting test items either from existing lists containing WA normative data or simply using high-frequency words to ensure word familiarity. Though valuable sources, the available norm lists (e.g. Kent-Rosanoff, 1910; Deese, 1965; Kiss et al., 1972) frequently used by lexical researchers were either compiled decades ago (thus, they may not reflect well the dynamic nature of WA behaviour) or many of them used the so-called discrete serial method for association collection, which substantially clouds the influence of lexical class on associative behaviour. Second, as pointed out by Meara (1982), most of the SWs in these norm lists contain high frequency words that tend to elicit the same responses both in a participant’s native and second language, which largely obscures the overall analysis of the L2 WA domain. Furthermore, when a test sample consists of only high frequency words, the generalizability of the results is substantially limited to just this frequency band since in L2 research we know little about the effects of word frequency on the qualitative and the quantitative associative patterning. Thus, by using a spaced sampling procedure for test item selection, I tried to address these problems and avoid bias in the collected WA data linked to the methodology of SW selection. Overall, the test sample showed a good representation of several frequency bands and all lexical categories of content words (i.e. nouns, verbs, adjectives, adverbs) (see Appendix 1).

Each SW was accompanied by a word familiarity scale (e.g. Dale, 1965; Paribakht and Wesche, 1993) in which there were four options identifying, respectively, four degrees of familiarity to choose from:

1) I have not seen this word before;
2) I have seen this word before but I don’t remember what it means;
3) I think this word means ____ [provide a synonym or brief explanation];
4) I know that this word means ____ [provide a synonym or brief explanation]).

With the discrete serial method of association collection, the first response to a given word becomes the SW for the second trial, the response on the second trial becomes a stimulus for the third trial, and so on.
The fifth option – (5) I associate this word with _____, _____, _____ was designed to collect WA data by asking the participants to give as many as three associations if they indicated their familiarity with the SW in option (3) or (4). It was decided to ask the participants to provide as many as three responses (instead of just one or as many as they could think of) in order to obtain a reasonable number of associations that would form a sufficiently large WA domain for each proficiency group. The test format also required the participants to respond to every SW in terms of its intended lexical category, which was listed next to it in cases of lexical ambiguity. The SWs were presented alphabetically in the order in which they were selected from the dictionary (Appendix 1). Thus, a total of 7854 WAs in response to familiar words were elicited ($n_{NSs} = 3232$, $n_{Advanced} = 3189$, $n_{Intermediate} = 1433$), which is a substantial amount of WA data to work with.

3 Scoring procedures

The first step in quantifying participants’ WAs was to compile a list of the associations generated by the participants of each group. For an association to be included in the list, a participant had to respond correctly to the intended lexical class of the SW as well as to, at least, one of its meanings in option (3) or (4) of the familiarity scale. For example, the SW hard was specified as an adverb in the test, so synonyms given in option (3) or (4) such as strenuously, laboriously, persistently, etc. satisfied the verification requirement and all associations following those or similar synonyms in option (5) were included in the respective WA list. However, synonyms such as difficult, strong, tough, solid, firm, etc. rendered the SW vaguely familiar because of failure to respond correctly to the listed lexical category of the SW. Therefore, the associations following such synonyms were not included in the analysis.

All responses were lemmatized and the following items were listed as separate associations:

1) Base words and some of their inflected forms were combined in one item: for example, inflection -s for nouns (e.g. bed and beds), inflection -s for verbs (e.g. collect and collects), inflections -er and -est
for adjectives (e.g. *smart–smarter–smartest*) and adverbs (e.g. *hard–harder–hardest*).

2) Irregularly inflected forms (e.g. *children, better, went, etc.*) were treated as separate from the base form associations (e.g. *child, good, go, etc.*).

3) Multiword responses were listed and scored as one item, based on the head word (e.g. *some people, burning desire, go out, etc.*).

4) When a multiword response repeated the SW, only the added element was counted (e.g. [SW] bracelet – [response] *silver* bracelet).

5) All derived forms were treated as separate items (e.g. *mindless, supportive, disregard, unusual, breathing, conquered,* etc.). Due to the nature of the task (word association elicitation), -ing and -ed morphemes, which can be both inflectional and derivational (for more details, see Bauer, 1983; Bauer and Nation, 1993), were treated as derivational.

Thus, three lists of associations were constructed, with the associations supplied to familiar words by the NSs, the L2 advanced learners and the L2 intermediate learner group. The quantitative features of the responses were scored as follows:

1) Total number of responses is a measure related to the size of the associative domain. It was determined by the total number of responses elicited from a participant to each familiar SW.

2) Response commonality is a measure related to the strength of the associative domain. It was determined by scoring each response in terms of the absolute frequency of its occurrence among the responses of a group. The lowest commonality score assigned to a WA was 1 (i.e. the association was given by just one participant in a group) and the highest score could be 29 (i.e. each participant in a group had supplied the same association to a given stimulus).

3) Number of different responses is a measure that indicates the heterogeneity of the associative domain, i.e. to how many different things and ideas a word is associated in the mind of a language user.
It was determined by the absolute number of different responses provided by a participant in a group.

The description of the qualitative characteristics of the WA responses was based on the analysis of the proportion of three types of responses: paradigmatic, syntagmatic, and phonological. Each association was classified as one of those types dependent on its lexico-syntactic relationship to the SW. The distinction between the different types of responses adopted in this study is the one commonly used by L1 and L2 researchers (e.g. Ervin, 1961; Deese, 1965; Clark, 1970; Meara, 1978; Piper and Leicester, 1980; Read, 1993; Söderman, 1993; Wolter, 2001).

In general, an association was classified as paradigmatic if it shared the same lexical class with the SW (e.g. advantageous – beneficial) and as syntagmatic if it belonged to a different lexical class (e.g. advantageous – benefit) or could form a syntactic string with the SW in spite of the two words sharing the same lexical class (e.g. pillar – community).

Phonological (clang) associations were defined as associations related to stimuli in phonological terms only (Singleton, 1999), without being semantically or syntactically linked to them. Therefore, morphological derivations such as defensive – offensive, amoral – moral were treated in this study as either syntagmatic or paradigmatic associations (not clang), because they were assumed to show knowledge of word derivation processes rather than some sort of an anomalous association behaviour.

It is only recently that L2 researchers have been more specific about the criteria they apply to their qualitative WA classification by giving detailed descriptions of response coding, which mostly follow the coding employed by L1 WA researchers (e.g. Piper and Leicester, 1980; Söderman, 1993; Wolter, 2001). Thus, to maintain consistency in the response classification procedure, all categories into which the associations were classified were specified in advance following the principles used in other similar studies. Unfortunately, there is no certain way to eliminate the grammatical ambiguity of some responses in the English language, but the following criteria were applied to the classification of the association data in an attempt to limit as much as possible any inconsistencies linked to the syntactic ambiguity of some words:

1) A response was counted as paradigmatic when it was from the same word class as the SW.
2) In all cases in which a response could be classified as either paradigmatic or syntagmatic (e.g. blanket (n.) – cover), it was coded as (potentially) paradigmatic since the analysis focused only on WAs generated by adults to familiar words.4

3) A response was classified as syntagmatic when it did not belong to the same form class of the SW (e.g. blanket – soft) or formed a syntactic string with the SW (e.g. baseball – cap; cassava – leaves).

4) Multiword responses (e.g. bed cover, etc.) were classified according to the relationship between the SW and the lexical class of the head word.

5) When the SW was repeated in the response (e.g. second – second place, back – back up), a response was counted as syntagmatic (Piper and Leicester, 1980).

6) Associations were classified as clang when they were related to a SW only in phonological terms (e.g. virtuosity – virtue).

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4 By and large, when coding associative responses into form classes, there is no certain way of eliminating the grammatical ambiguity of certain classes; hence, no standard procedure of coding such responses. In addition, WA researchers quite infrequently discuss their approaches to resolving the syntactically ambiguous relationship between SWs and some of the associations they elicit, which leaves us with little previous experience to follow. In this study, it was decided to treat the cases in which responses could be coded into either paradigmatic or syntagmatic categories as potentially paradigmatic since the study deals only with associations generated by adults to familiar words. Early L1 research (e.g. Ervin, 1961) into the relationship between age and type of responses consistently found that while young children gave mostly syntagmatic responses, older children and adults tended to produce predominantly associations from the same lexical category as the SW (i.e. paradigmatic responses). Researchers started interpreting this shift from overwhelmingly syntagmatic (for young children) to predominantly paradigmatic associative connections (for older children and adults) as a developmental phenomenon related to maturation and sophistication of cognitive processes. However, subsequent research (e.g. McNiel, 1966) suggested that the shift in association patterns with increasing age can be explained either by the acquisition of new features of words, which would result in choosing a response that shared the maximum number of features with a stimulus, or by change in the strategies used in searching and matching stimulus–response features. Stolz and Tiffany (1972) confirmed the first hypothesis, arguing that cognitive skills as well as knowledge of words and the acquisition of more features and meanings develop dramatically with young children. Thus, isolating the effects of one of the factors and ignoring the effects of the other would inevitably result in an incomplete account of the shift in WA response pattern. The researchers further hypothesized that young children respond with overwhelmingly syntagmatic associations not just because their cognitive processes are immature but because their familiarity with the SWs is relatively low or non-existent. Their experiment revealed that while the responses of adults to unfamiliar words were predominantly along syntagmatic lines and patterned very much like the responses given by young children, their responses to familiar words were primarily paradigmatic. Thus, the researchers concluded that familiarity with word features, not just cognitive development, plays an important role in the type of WAs generated to words, which makes WA tests sensitive instruments for capturing the state of one’s lexical knowledge about a given word (Stolz and Tiffany, 1972).
This detailed specification of the response classification criteria and their consistent application greatly reduced the number of subjective judgments in the WA coding and, at the same time, allowed for a comparison of the results of the present analysis with findings of other studies since most of these criteria have been used by other L2 WA researchers.

V Results

Two one-way ANOVAs compared the quantitative and qualitative associative patterns elicited by the three proficiency groups (NS, L2 advanced, and intermediate learners). Means and standard deviations are presented in Table 1.

The analysis of the quantitative patterns of associative connections yielded a significant group effect on all dependent variables associated with the quantitative features of participants’ meaning connections, thus indicating statistically significant differences among the three groups for total number of responses, $F(2, 84) = 35.978, p \leq .01, \omega^2 = .45$; within-group associative commonality, $F(2, 84) = 82.186, p \leq .01, \omega^2 = .65$, and number of different responses, $F(2, 84) = 32.545, p \leq .01, \omega^2 = .42$. In the main, the results supported a conclusion that the quantitative characteristics of the NSs’ mental lexicons are different from the quantitative features of the L2 advanced and intermediate learners’ lexicons. To find out where the differences were stemming from, post hoc pairwise comparisons were conducted to compare the groups on the three quantitative measures. The post hoc comparisons, in which the significance level was adjusted to .05 based on the Bonferroni rationale, revealed that the mean differences among the groups were statistically significant in all subsets of comparisons showing how the three groups differed. On average, the intermediate learners responded with a significantly smaller number of responses than the NSs (95% CI = \(-82.559, -41.717\); $p \leq .05$) and the advanced learners (95% CI = \(-81.076, -40.234\); $p \leq .05$), a smaller number of common responses than the NSs (95% CI = \(-296.007, -196.406\); $p \leq .05$) and the advanced learners (95% CI = \(-248.870, -149.268\); $p \leq .05$), as well as a smaller number of different responses than the NS (95% CI = \(-51.948, -23.500\); $p \leq .05$) and the advanced learner group (95% CI = \(-57.327, -23.500\); $p \leq .05$).
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<td>29</td>
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<tr>
<td>Within-group associative commonality</td>
<td>29</td>
<td>29</td>
<td>29</td>
</tr>
<tr>
<td>Number of different associations</td>
<td>29</td>
<td>29</td>
<td>29</td>
</tr>
<tr>
<td>Proportion of paradigmatic associations</td>
<td>29</td>
<td>29</td>
<td>29</td>
</tr>
<tr>
<td>Proportion of syntagmatic associations</td>
<td>29</td>
<td>29</td>
<td>29</td>
</tr>
</tbody>
</table>
-28.880; $p \leq .05$). However, the advanced learners were not found to be significantly different from the NSs on the three quantitative measures (see Figure 1).

Thus the results of the analysis confirmed the first hypothesis that there were differences in the quantitative features of NSs’, L2 advanced and intermediate learners’ mental lexicons measured by participants’ total number of WAs, within-group response commonality and number of different responses. Overall, the size, commonality and heterogeneity of the advanced learners meaning connections closely resembled the NSs’ quantitative patterns of associative links, whereas the L2 intermediate learners significantly differed in this respect from the NSs and the advanced learners alike.

The analysis of the qualitative features of participants’ lexicons focused on three types of associations: paradigmatic, syntagmatic and phonological. Interestingly, no phonological associations were found among the responses generated to familiar words, which suggests that word familiarity, rather than as previously thought loose organization of the L2 mental lexicon, may be the factor that motivates the elicitation of more phonologically than semantically or syntactically linked

![Figure 1](http://slr.sagepub.com)
associations. Therefore, only the results of the analysis of the proportion of paradigmatic and syntagmatic associations are reported here. Surprisingly, the analysis of the two types of responses yielded a non-significant group effect on the outcome variables, thus indicating no statistically significant differences among the three groups in their mean proportion of paradigmatic, $F(2, 84) = 2.04, p \geq .05$, and syntagmatic responses, $F(2, 84) = 2.02, p \geq .05$. The overall ANOVA did not confirm the second hypothesis, which led to the conclusion that L2 advanced and intermediate learners’ qualitative characteristics of lexical organization are not different from the qualitative features of NSs’ mental lexicons. Moreover, as Figure 2 shows, the overall pattern of responses was the same across the three groups, i.e. the participants of the three groups gave more paradigmatic than syntagmatic responses to the words they were familiar with, and no clang associations at all.

In other words, contrary to the findings of other studies (e.g. Meara, 1978; Piper and Leicester, 1980; Wolter, 2002) – which found that the major qualitative difference between NSs’ and L2 learners’ association patterns was linked to L2 learners’ overwhelmingly syntagmatic connections between the words in their mental lexicon – the results of this study support a qualitatively similar overall pattern of lexical structure, which is only quantitatively different across the three groups.

![Figure 2](http://slr.sagepub.com)

**Figure 2.** Mean proportion of paradigmatic and syntagmatic responses generated to familiar words
To test the third hypothesis and gain insight into the strength of the relationships between the quantitative and the qualitative measures of participants’ lexical organization, the bivariate Pearson product-moment correlations were examined. The scatter diagrams of each variable were found to be normally distributed and linear. The bivariate relationships between the variables did not show that the qualitative and the quantitative features of the participants’ lexicons were strongly related (see Table 2).

While there were strong and significant relationships between the quantitative measures and the qualitative measures as separate sets, e.g. total number of associations and associative commonality ($r_{\text{NSs}} = .860$; $r_{\text{Advanced}} = .808$; $r_{\text{Intermediate}} = .959$, $p \leq .01$), total number of associations and number of different associations ($r_{\text{NSs}} = .525$; $r_{\text{Advanced}} = .856$; $r_{\text{Intermediate}} = .918$, $p \leq .01$), associative commonality and number of different responses ($r_{\text{NSs}} = .499$; $r_{\text{Advanced}} = .624$; $r_{\text{Intermediate}} = .880$, $p \leq .01$), paradigmatic and syntagmatic associations for the three groups ($r = -1.000$, $p \leq .01$), the two sets of measures were not significantly correlated. The implications of this finding will be discussed in the discussion section.

VI Discussion

Word association tests have served various research purposes, depending on the theoretical perspective taken to the interpretation of WA data. One of their practical uses as a research tool relates to contemporary theories of associative structure, which propose that WAs represent the way in which semantic information is structured in memory. From this point of view, as pointed out by Nelson (1977: 102), ‘the study of word association structure is another approach to the organization of semantic memory, a subject worthy of study on its own terms, without regard to its connection to linguistic or cognitive function’. Consequently, in L2 research, WA tests have often been used to examine how L2 learners organize their lexical knowledge and how the structure of their mental lexicons compares to the features of NSs’ lexicons. Psycholinguistic research interested in conceptual representation in bilingual memory has taken the use of WA tests even a step further by suggesting that, in addition to revealing how lexical information is represented in L2
Table 2  Correlation matrix for the groups of NSs of English \((n = 29)\), L2 advanced \((n = 29)\) and intermediate learners of English \((n = 29)\)

<table>
<thead>
<tr>
<th>Pearson correlation</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Total number of associations</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>2) Within-group associative commonality</td>
<td>.860*</td>
<td>.808*</td>
<td>.959*</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>3) Number of different associations</td>
<td>.525*</td>
<td>.856*</td>
<td>.918*</td>
<td>.499*</td>
<td>.624*</td>
</tr>
<tr>
<td>4) Proportion of paradigmatic associations</td>
<td>.149</td>
<td>.159</td>
<td>–</td>
<td>.120</td>
<td>.079</td>
</tr>
<tr>
<td>5) Proportion of syntagmatic associations</td>
<td>–</td>
<td>.145</td>
<td>–</td>
<td>.159</td>
<td>.120</td>
</tr>
</tbody>
</table>

Note: *\(p < .01\)
learners’ memory, the WA task reflects conceptual and lexical processing as well (van Hell and de Groot, 1998). While the present study did not touch upon lexical processing, it was designed to probe the qualitative and quantitative features of L2 learners’ lexical knowledge as their proficiency increases. Thus, one of the goals was to throw light on this knowledge by comparing the features of L2 learners’ WA domains with those of NSs for words the participants could identify as known to them. In addition, it aimed at finding out whether differences in the NSs’ and L2 learners’ lexicons were predominantly qualitative, quantitative or both in an attempt to establish what a well-structured lexicon looks like. Finally, it was of interest to the researcher to examine the strength of the relationship between the qualitative and the quantitative features of L2 learners’ lexicons, since a link between these two types of features has been assumed but not empirically explored.

The examination of the quantitative characteristics of the mental lexicon of the three groups of participants (NSs, L2 advanced, and L2 intermediate learners of English) revealed that differences between the NSs’ and the L2 learners’ mental lexicons can be detected primarily at an intermediate level of proficiency. The analysis of the size and the diversity of the intermediate learners’ WA domains showed that they had a WA repertoire much smaller in size and less diverse than the NSs’ and the advanced learners’, whereas the advanced learners’ associative domain was similar to the NSs’ in size, but showed a trend of slightly greater heterogeneity. In light of the generally well-established positive relationship between vocabulary size and size of WA domain, one possible conclusion to be drawn from these results is that smaller vocabulary sizes (an average of 6000 words for L2 intermediate learners’ vocabularies; Zareva et al., 2005), are characterized by fewer links among words, a lower degree of commonality and lesser heterogeneity of meaning connections. Overall, these features create the impression that the intermediate learners’ lexicons are relatively loosely connected since their quantitative characteristics do not point to the strong and systematic interrelatedness among familiar words found for the NSs’ and the advanced learners’ lexicons. Larger vocabularies (containing over 9000 words; Zareva et al., 2005) show greater connectivity and allow language users to associate every word they know with a larger number of different things and ideas; hence, language users with larger
vocabularies have considerably richer connections, both in size, commonality and heterogeneity. So, it would be safe to conclude that the larger the vocabulary, the better connected it should be expected to be, especially in terms of number and variety of connections.

An important way in which the quantitative characteristics of the L2 intermediate learners’ lexical structure differed from the other two groups concerns the degree of within-group commonality of response domains. Generally, the idea of comparing the extent to which L2 learners’ associative behaviour resembles the commonality of NSs has been borrowed from L1 lexical research, which has consistently found that NSs tend to cluster their associations around a small number of commonly given responses. For example, a cursory look at the *Edinburgh Association Thesaurus* (http://www.eat.rl.ac.uk; Kiss et al., 1972) shows, for instance, that 81% of NSs’ responses to the SW blanket cluster around only 10 associations (*bed, warm, sheet, electric, cover, warmth, wool, soft, bath, snow*), and only 19% of all responses are idiosyncratic in nature. Consequently, this high degree of associative commonality has been interpreted as indicative of nativelikeness of associative behaviour by some researchers (e.g. Schmitt, 1998) who started comparing the degree of L2 learners’ associative commonality to that of NSs. This approach was further encouraged by findings suggesting that L2 learners tend to show less consistent patterns of associative commonality than NSs, though there is development toward the NSs’ norms with an increase in proficiency (e.g. Meara, 1978; Vermeer, 2001). Nonetheless, the lower associative commonality was more often than not discussed as indicative of unstable meaning connections. It is only recently that the usefulness of the notion of associative nativelikeness as an indicator of stability of lexical organization has been challenged by findings suggesting that using nativelike associative commonality to measure consistency of L2 learners’ lexical organization is an approach that is sensitive only to the broad distinction between NSs and NNSs, which does not seem to have much value in an educational context (Zareva, 2005). Therefore, instead of using nativelike associative commonality to account for L2 learners’ consistency of the associative domain, within-group associative commonality was used in this study as a factor that takes into account the linguistic as well as the extralinguistic factors that help shape L2 learners’ commonality of
meaning connections. Additionally, it has been found that as a measure of how well a word is integrated into the overall network of connections in the L2 learners’ lexicon, within-group associative commonality has a potential to capture differences related to an increase in language proficiency, which nativelike associative commonality does not have (Zareva et al., 2005).

When the three groups were compared on their within-group associative commonality, the advanced learners showed a non-significantly lower associative commonality than the NSs, whereas the strength of the intermediate learners’ WA domains was noticeably less consistent than that of the NSs and the advanced learner group alike. This suggests that an increase in language proficiency does have an effect on the within-group commonality of learners’ lexical connections in that these significantly increase as the proficiency increases. So it is safe to conclude that within-group response commonality stabilizes with increased proficiency, but the overall pattern remains the same – that is, the L2 learners’ lexicons generally show a lesser degree of commonality than the monolingual lexicon. It would be interesting to further explore the extent to which the connections between words in the L1 lexicon contribute to the lexical connectivity of the L2 lexicon and the interplay between both at different proficiency levels. Such a line of exploration will also add to our understanding of the processing resources required to store two lexical systems and the breadth of the task L2 learners face in building lexical connections in their mental lexicons.

Interestingly, the analysis of the qualitative features of participants’ associative domains revealed a different picture. The results showed that there were no differences in the overall association patterns among the three groups, i.e. the participants gave predominantly paradigmatic associations and fewer syntagmatic responses to the words they knew. Apparently, once L2 learners reach an intermediate level of proficiency, their potential to generate lexico-syntactically related responses develops towards NSs’ capacity. This finding adds support to Söderman’s argument (1993) that adult L2 learners pattern their responses very much like adult NSs do, even at the lower levels of proficiency, where SW familiarity can have a greater effect on response patterning than usually acknowledged.
There are surprisingly few studies concerning the qualitative patterns of L2 associative responses, which, nonetheless, have yielded surprisingly controversial results. The most commonly advanced argument concerning these features of L2 learners’ associative patterning echoes findings from L1 research of a syntagmatic-paradigmatic shift noticed with children as they grow and develop their lexicons (e.g. Ervin, 1961). Several L2 researchers have been attracted to the idea of a response shift and tried to draw parallels between L1 children’s and L2 learners’ developing lexicons. Their main point of interest was to find out whether there is a tendency for L2 learners to produce more syntagmatic and clang associations, as L1 English-speaking children tend to do, or whether a L1 adult response pattern (i.e. a paradigmatically-dominated associative pattern) evolves early in the learning process. In his early research, Meara (1978) reported that the participants in his study, a group of L2 learners of French preparing for the O-level examination in French, produced a high proportion of paradigmatic responses, few and quite unsystematic syntagmatic associations, and a surprisingly large number of clang and un-French associations. Thus, the researcher concluded that this was indicative of a lack of a proper semantic organization for the L2 mental vocabulary, which could largely explain why L2 learners experience difficulties in processing both written and spoken language. Similarly, Wolter (2001) compared Japanese learners of English to NSs of English, but added the dimension of SW familiarity to his analysis. In the main, his analysis revealed a considerable difference in the qualitative patterning of the NSs and the L2 learners participating in his study, even for the words they were familiar with. Thus, the researcher concluded that the syntagmatic connections play an important role in the organization of L2 learners’ lexicons and the L2 syntagmatic dominance did not necessarily mean that the organization of L2 mental lexicons would be inferior to NSs’, especially when SW familiarity was taken into account.

Regrettably, few studies have used more than one proficiency group of L2 learners, which explains why conclusions concerning L2 lexical structure rarely discuss the influence of proficiency on learners’ qualitative patterns of meaning organization. The few exceptions in this regard are the studies conducted by Piper and Leicester (1980) and Söderman (1993), which involved two proficiency groups in studying
the effects of language proficiency on L2 learners’ lexical connections. In the main, the results of the present study confirm the general conclusion from previous research of no significant differences in the qualitative patterns of lexical organization of NSs and L2 learners at higher levels of proficiency. Learners who have reached an intermediate proficiency level already have lexicons structured along predominantly paradigmatic lines. Similarly, the results do not support the hypothesis adopted from L1 research of a developmental shift from more “child-like” syntagmatically-dominated lexicons to more “adult-like” paradigmatically-governed connections of the L2 learners’ associative networks. On the contrary, my inquiries into the matter suggest that this need not be the case and L2 learners with an intermediate size of vocabulary (approximately 6000 words and above) have already stable paradigmatic-over-syntagmatic patterns of connections among the words they know. Moreover, none of the participants produced clang associations for the words in this category, which leads to the conclusion that SW familiarity, rather than loose organization of the L2 mental lexicon, motivates elicitation of more phonologically than semantically or syntactically based associations. To further explore this possibility it would be worthwhile examining the qualitative features of participants’ associative patterns elicited to the so-called frontier words, i.e. words that participants judge as familiar but fail to acceptably define (Trembly, 1966; Durso and Shore, 1991), which will help discover how a lower level of familiarity affects, if at all, the overall patterning of associations among participants with differing levels of language proficiency.

Finally, while it was not surprising to find that there were strong and significant relationships between the quantitative and the qualitative measures as separate sets, it was counterintuitive to discover that there were a few weak correlations between the variables cross-sectionally. This finding suggests that quantitative and the qualitative features develop fairly independently and an increase in the size, commonality and heterogeneity of L2 learners’ associative connections does not necessarily affect the distribution of their paradigmatic and syntagmatic links. Apparently, adult L2 learners who have already reached an intermediate level of proficiency have also shaped their lexical connections of familiar vocabulary along predominantly paradigmatic lines,
i.e. pretty much the same way native-speaking adults and advanced learners do. This may be attributable to their developed overall cognitive skills, as well as their word familiarity (Stolz and Tiffany, 1972). The empirical implication of this conclusion should be seen in the application of WA tests in L2 research as “a rather sensitive index of the state of one’s lexical knowledge about a given word” (Stolz and Tiffany, 1972: 45), rather than explaining away differences between NSs’ and L2 learners’ lexical organization without regard to familiarity as a powerful factor in the development of the organization of the mental lexicon.

VII Conclusions

In sum, the analysis of the WA data generated by advanced and intermediate learners of English revealed quantitative but not qualitative differences in the patterns they develop to structure their lexical knowledge. The quantitative differences were most noticeable in the intermediate learner group, who differed from the other groups in the overall number, stability and diversity of meaning connections among words they are already familiar with. Qualitatively, adult L2 learners, like NS, show a preference for a greater proportion of paradigmatic than syntagmatic connections for familiar words, which is most probably an artifact of their well-developed cognitive skills as well as their word familiarity. In any event, it will be valuable to find out more about the way familiarity influences the development of meaning connections, as well as the way word features, such as lexical class and frequency of occurrence, for example, affect the qualitative and the quantitative characteristics of L2 learners’ associative domains.

VIII References


*Edinburgh Association Thesaurus*. Available online at http://www.eat.rl.ac.uk (January 2007).


Meara, P. 1978: Learners’ associations in French. *Interlanguage Studies Bulletin* 3, 192–211.


Appendix 1  List of the SWs used in the study with their frequency of occurrence

<table>
<thead>
<tr>
<th>SWs</th>
<th>U-value</th>
<th>SWs</th>
<th>U-value</th>
<th>SWs</th>
<th>U-value</th>
<th>SWs</th>
<th>U-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) abattoir</td>
<td>0.0653</td>
<td>20) drawback (n)</td>
<td>2.000</td>
<td>39) masochism</td>
<td>0.0163</td>
<td>58) settled</td>
<td>73.000</td>
</tr>
<tr>
<td>2) advantageous</td>
<td>2.0000</td>
<td>21) edifice</td>
<td>0.5651</td>
<td>40) middling (adj)</td>
<td>0.3522</td>
<td>59) shuttle (n)</td>
<td>5.4265</td>
</tr>
<tr>
<td>3) amoral</td>
<td>0.0326</td>
<td>22) entrust</td>
<td>0.1961</td>
<td>41) monorail</td>
<td>0.3932</td>
<td>60) sleigh (n)</td>
<td>1.0000</td>
</tr>
<tr>
<td>4) array (v)</td>
<td>4.695</td>
<td>23) experimentation</td>
<td>4.0000</td>
<td>42) naïve</td>
<td>1.0000</td>
<td>61) solstice</td>
<td>0.6393</td>
</tr>
<tr>
<td>5) back (v)</td>
<td>35.7200</td>
<td>24) fathom (v)</td>
<td>1.4405</td>
<td>43) official (adj)</td>
<td>35.0000</td>
<td>62) spotlight (n)</td>
<td>1.3416</td>
</tr>
<tr>
<td>6) beaten</td>
<td>11.0000</td>
<td>25) flagstone</td>
<td>0.5164</td>
<td>44) out (n)</td>
<td>0.5693</td>
<td>63) studio</td>
<td>9.8213</td>
</tr>
<tr>
<td>7) blanket (n)</td>
<td>42.0000</td>
<td>26) forgo</td>
<td>0.4498</td>
<td>45) parable</td>
<td>0.4153</td>
<td>64) sweep (v)</td>
<td>38.000</td>
</tr>
<tr>
<td>8) bracelet</td>
<td>3.0000</td>
<td>27) gambol (v)</td>
<td>0.0326</td>
<td>46) penance</td>
<td>0.6626</td>
<td>65) telegraph (n)</td>
<td>14.1693</td>
</tr>
<tr>
<td>9) bursar</td>
<td>0.0424</td>
<td>28) glower</td>
<td>0.3817</td>
<td>47) pillor (n)</td>
<td>6.0000</td>
<td>66) throw (n)</td>
<td>53.000</td>
</tr>
<tr>
<td>10) cassava</td>
<td>0.6986</td>
<td>29) griddle (n)</td>
<td>0.8498</td>
<td>48) point-blank (adj)</td>
<td>0.0490</td>
<td>67) toxic</td>
<td>4.000</td>
</tr>
<tr>
<td>11) choke (n)</td>
<td>3.1078</td>
<td>30) hard (adv)</td>
<td>66.0300</td>
<td>49) prefect</td>
<td>0.5751</td>
<td>68) tuner</td>
<td>0.1177</td>
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<tr>
<td>12) coinage</td>
<td>0.0597</td>
<td>31) high (adv)</td>
<td>10.4500</td>
<td>50) promontory</td>
<td>0.9539</td>
<td>69) unnerve</td>
<td>0.4292</td>
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<tr>
<td>13) concede</td>
<td>0.9684</td>
<td>32) hunger (n)</td>
<td>22.0000</td>
<td>51) putative</td>
<td>0.0925</td>
<td>70) virtuosity</td>
<td>0.0326</td>
</tr>
<tr>
<td>14) contravention</td>
<td>0.0119</td>
<td>33) inception</td>
<td>0.5556</td>
<td>52) refuse (v)</td>
<td>58.0000</td>
<td>71) weaken</td>
<td>4.5543</td>
</tr>
<tr>
<td>15) crampons</td>
<td>0.0588</td>
<td>34) instill</td>
<td>0.5229</td>
<td>53) residence</td>
<td>7.0000</td>
<td>72) wind (v)</td>
<td>15.6300</td>
</tr>
<tr>
<td>16) custodian</td>
<td>1.2348</td>
<td>35) jib (n)</td>
<td>0.3153</td>
<td>54) rigidity</td>
<td>0.0119</td>
<td>73) yield (v)</td>
<td>12.5000</td>
</tr>
<tr>
<td>17) defensive</td>
<td>4.0000</td>
<td>36) lackadaisical</td>
<td>0.2531</td>
<td>55) ruler</td>
<td>44.0000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18) diamond</td>
<td>24.0000</td>
<td>37) livelihood</td>
<td>1.0814</td>
<td>56) savor (v)</td>
<td>0.7303</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19) dissension</td>
<td>0.3310</td>
<td>38) macaw</td>
<td>0.0488</td>
<td>57) second (adj)</td>
<td>331.0000</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes: v = verb; n = noun; adv = adverb; adj = adjective. U-value is the frequency of occurrence per million tokens weighted by D (Dispersion value). The values are taken from Zeno et al.'s (1995) *The educator's word frequency guide*, which is based on over 60 000 text samples (more than 17 million words) from a wide range of texts that students in the USA are likely to encounter throughout their school and college years.