The Development of Lexical Organization in Chinese EFL learners at Tertiary Level

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This study aims to explore the development of L2 lexical organization through a word association test on the part of 200 Chinese EFL learners at tertiary level. The general developmental pattern is that the subjects at higher learning stages produce more semantic associations than those at lower learning stages. The syntagmatic-paradigmatic shift, however, is not detected in this study. The associations also evince the mediation and interference of L1 semantic system and the deviation of L2 lexical organization from that of L1. The results and the implications are discussed from the perspectives of depth of vocabulary knowledge, the importance of overcoming the L1 semantic mediation and constructing a well-structured mental lexicon.

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According to Bock and Levelt (1994), "our mental store of words and basic information about them is called the mental lexicon" (p. 950). As an important dimension of lexical competence (e.g., Jiang, 2004; Meara, 1996; Qian, 2004), L2 lexical organization refers to the storage, connection, and representation of words in the learner's brain. Most previous studies of L2 vocabulary acquisition have focused on the development of vocabulary size or depth of vocabulary knowledge (e.g., Laufer, 1991, 1998; Laufer & Paribakht, 1998; Read, 1993, 2000; Schmitt & Meara, 1997; Wesche & Paribakht, 1996), and little research efforts have been made to investigate the development of L2 lexical organization (but see Finkbeiner, 2002; Wang, 2007). As an attempt to bridge the gap, the present study investigates the developmental features of lexical organization on the part of English majors in China.

One of the research paradigms that explores lexical organization most directly involves the use of word associations. Free word association experiments, in which subjects are required to give the words that come to mind when presented with a stimulus word, have been used in both psychological and linguistic studies (Schmitt, 1998). The underlying assumption is that automatic responses will consist of words that have the strongest connections with the stimulus word in the mental lexicon. By analyzing associations, we can gain clues about the mental relationships between words and thus the lexical organization. Associations can be analyzed according to what category they belong to. Three of the most important categories are clang associations, syntagmatic associations, and paradigmatic associations. In clang associations, the response is similar in form or sound to the stimulus word, but is not related semantically (e.g. STOVE-*solve*[i]).

Responses that have a sequential relationship to the stimulus word are called syntagmatic, and usually, but not always, have different word classes (e.g. BABY-*lovely*). Responses of the same word class as the stimulus word are labeled as paradigmatic (e.g. FOOT-*hand*). The word association studies on L1 adults show that their associations mainly fall into the paradigmatic and syntagmatic categories while clang associations are rare. As to the difference in response types between L1 adults and children, the findings are that children tend to give more clang associations than adults (e.g., Carter, 1998; Namei, 2004; Schmitt, 2000). As clang associations decrease, syntagmatic responses increase. This can be compared to adults' associations, which are more paradigmatic. Studies also indicate that the syntagmatic–paradigmatic shift occurs between the ages of five and ten as a learner's language matures, and children produce proportionally fewer syntagmatic responses and proportionally more paradigmatic ones (Namei, 2004).

Early L2 word association studies focus on comparing the structure of L2 mental lexicons with those of L1. The body of frequently quoted data in support of the phonological view of L2 lexical organization was the result of word association tests in the Birkbeck Vocabulary Project, directed by Meara (Carter, 1998; Channell, 1988; Gass & Selinker, 1994; Harley, 1995). Meara detected several traits of L2 associations. First, L2 learners' associations are unstable and much less regular. Second, L2 learners tend to produce more clang or syntagmatic responses, whereas L1 adults tend toward paradigmatic responses. Third, L2 subjects frequently misperceive the stimulus words, leading to totally unclassifiable associations. Meara considered that the above traits revealed that the L2 lexical organization is quite different from that of the native speaker.

Meara's interpretation of his data and conclusion of the phonological nature of L2 lexical organization have been challenged by Singleton and his Trinity College Dublin Modern Languages Research Project. According to Singleton (1999), Meara's results were not wholly founded on the use of very common words as stimuli, and some of the items are low frequency ones. Given that Meara's subjects had relatively modest knowledge of the L2, it seems likely that the subjects' responses to the stimuli reflect a simple state of ignorance rather than an L2 lexical organization qualitatively different from that of the L1. Another possibility is that in some instances the items presented might simply have been misidentified as other words, which was acknowledged by Meara himself. A study by O'Gorman (1996) shed further light on this issue. Her data were collected from L2 word association test of 22 Cantonese speakers whose English was judged to be at the intermediate proficiency level. The results show that most responses have clear semantic links with the relevant stimuli. Zareva's (2006) study also suggests that differences in the organization of lexical knowledge between L2 speakers and native speakers are quantitative rather than qualitative.

As to the syntagmatic-paradigmatic shift in the development of L2 lexical organization, Söderman's (1993) four groups of EFL subjects at different levels of proficiency evinced a shift in response type in respect of the same

English word-association test from proportionally more to proportionally fewer clang responses and from proportionally more to proportionally fewer syntagmatic responses as their L2 proficiency increased. However, Söderman (1993) notes that even the word associations of the most proficient learners still contained a surprising amount of syntagmatic and clang responses, and that the least proficient group gave an impressive number of paradigmatic responses. Instead of interpreting the findings as indicating a simple causal relationship between increased overall linguistic proficiency and a general change in L2 lexical organization, Söderman argues that a specific lexical item will elicit different types of responses at different stages of its incorporation into an individual's mental lexicon irrespective of the global proficiency levels. A study conducted by Wolter conforms to Söderman's viewpoint. Based on a depth of word knowledge model, Wolter (2001) employed a free word association task to compare the structure of L1 and L2 mental lexicons. His major assumption is that words in the mind are not in the same state and words are known to a varying degree at a given time. The study found that, for words that were well known to native and nonnative speakers, both the two groups of subjects produced a considerable amount of paradigmatic responses. There was a gradual increase in paradigmatic responses when words became more and more familiar to the L2 learners. Zhang (2003) investigated her Chinese EFL learners' mental lexicon by adopting Wolter's word lists as stimulus words. She found that even words labeled as "very familiar" by her subjects elicited more clang associations than native speakers. Her findings lend support to Meara's phonologically-dominated structural pattern of L2 mental lexicon.

Concerning the structure of L1 and L2 mental lexicons, the results of word association studies point to two different views: The organization of L2 mental lexicon is basically phonologically-driven while that of L1 mental lexicon is semantically-based; both L1 and L2 mental lexicons are structured semantically and to what degree a word is linked with other words semantically is determined by how well the word is integrated into the internal lexicon. The unsolved problem is which view can reflect the reality of the L2 mental lexicon and correctly characterize it. In addition, the developmental features of L2 lexical organization are inadequately tackled and demonstrated. This study is intended to investigate the developmental features of L2 learners' lexical organization, and the specific research questions addressed are as follows:

(1) Is there a syntagmatic-paradigmatic shift concerning the L2 lexical organization of the subjects across four learning stages?

(2) Is there a shift from a more phonologically-based pattern to a more semantically-based pattern concerning the L2 lexical organization of the subjects across four learning stages?

(3) What are the developmental features of the subjects' associations classified as "no-response", "clang-other", "paradigmatic", "syntagmatic", and "encyclopedic" across four learning stages?

METHOD

Participants

The participants for the research were recruited from Liaocheng University in China, where the researcher was a faculty member of the School of Foreign Languages and had worked as an English teacher for about 16 years. Thus, it would be easier for her to get necessary support from the school and her colleagues in the course of investigation. Four hundred and twelve English majors from 16 intact classes from Year One through Year Four participated in the study. The number of students from four freshman classes, four sophomore classes, four junior classes, and four senior classes were 101, 105, 104, and 102 respectively. For the total of 412 students, 15 of them did not complete the word association test, resulting in the useful data of 397 students. Following a stratified-random sampling procedure, 200 students (50 freshmen, 50 sophomores, 50 juniors, and 50 seniors) from the population of 397 participants were selected as subjects for the present research. The participants' English learning background and receptive vocabulary size were obtained from both a questionnaire and the Vocabulary Levels Test administered before the word association test. The questionnaire indicated that the subjects' ages ranged from 18 to 25, with an average of 21.2. Among the 200 subjects, 144 (72%) were female and 56 (28%) male. The result of the Vocabulary Levels Test showed that the receptive vocabulary sizes of the four groups of students were significantly different from each other, with the learners at higher learning stages having more vocabulary and those at lower learning stages having less vocabulary.

Elicitation instrument

The elicitation instrument was based on the Kent-Rosanoff word association list (1910, as cited in Postman & Keppel, 1970, p. 3), which contained 100 frequently occurring and emotionally neutral English words. One advantage of using Kent-Rosanoff word association list is that it has been used in many studies, both with native speakers and with second language learners of many different languages. Furthermore, there are established word association norms based on the list (Kiss, Armstrong, Milroy & Piper, 1973; Postman & Keppel, 1970), which provide an opportunity to compare the responses from L2 learners and those from the native speakers of English. The second advantage is that most of the words in the list are highly frequent, making them serve as the stimulus words with learners across a wide range of proficiency levels. The weakness of the list, however, is that some of the stimulus words are so common that both native speakers and L2 learners produce predictable responses. For example, according to *The Edinburgh Associative Thesaurus* (EAT)[ii] (Kiss et al., 1973), for the word KING, the frequency of the word *queen* is 45% of all the responses. Some studies in L2 word association have also shown that L2 learners also produce stereotypical

responses to these words (e.g., Meara & Fitzpatrick, 2000; Wolter, 2001). The same tendency to produce highly consistent responses to some words for both L2 learners and native speakers deceptively veils the underlying organization of L2 mental lexicon. To overcome the aforementioned limitations of the Kent-Rosanoff word association list, a word screening procedure was adopted to sift out the words eliciting predictable responses as shown in EAT. The criteria to select the prompt words for the research were as follows. The stimulus words typically eliciting a single, dominantly primary response would not be included in the present study. The formal yardstick was that the most frequent response to the stimulus word, as reported in the EAT, should not exceed 20% of all the reported responses. In this way, we selected stimulus words typically generating a wide variety of different responses. Forty words were selected with the most frequent response of native speakers ranging from 8% to 19% of the reported responses in EAT. The selected word list contained three adjectives, 27 nouns, seven words which can be interpreted both as nouns or as verbs (e.g., WISH and SLEEP), and three words which can act as both adjectives and nouns (e.g., RED). The average frequency was 201 occurrences per million according to the British National Corpus (BNC). The word association test comprised one sheet of paper with the 40 stimulus words arranged in columns and each word followed by a box for the subjects to write the response.

Procedures

The data were collected during the subjects' regular class time. The test instruction required the learners to respond to the stimulus word by writing down the first response to the stimulus word as quickly as they could. In cases in which the participants were unfamiliar with word association tests or when they still did not understand what they were supposed to do, the directions were explained orally by the proctors as a supplement to the written instructions in the test sheet, and several additional stimulus words had been practiced before the subjects responded to the word list in the test. They were encouraged to respond even if they were not sure of the meaning of the prompt word. It took them five minutes to finish responding to 40 test items. At the end of the phase, the proctors checked the test papers carefully to ensure the required information such as name and class were included in the test papers.

Classification model

Word associations in the present study are classified as no-response, clang-other responses, syntagmatic responses, paradigmatic responses and encyclopedic responses. (1) A category of "no-response" was given for some cases in which participants simply could not respond. (2) Clang associations are responses that are phonologically related to the stimulus words (Meara, 1983). A clang fits the sound structure of the stimulus word, but without any apparent semantic connection to it. Here "other" responses include the

derivative and inflectional forms of the stimulus words, for example, SLEEP-*slept* and COMFORT-*comfortable*. Another type of "other" responses contains those that are caused by the subjects' misperception of the stimuli. (3) A paradigmatic relation holds between words from the same grammatical category (Lyons, 1995 p. 124). This means that such words are interchangeable in a sentence. However, there are responses that do not belong to the same grammatical class as the stimulus word but have a very clear semantic relation to it. For example, the prompt word JOY elicited responses such as *happy*, which has semantic relation with JOY. If *happy* is classified as syntagmatic in this example, the close semantic relationship that exists between the stimulus and the response is lost. The basic criterion for paradigmatic categorization is that the response word has a clear semantic relationship to the stimulus word, independent of their grammatical categories. This method of interlinking words semantically is also adopted in the EuroWordNet database (Ide, Greemstein & Vossen, 1998). (4) A syntagmatic relationship is defined as link between words that can be joined together in a well-formed syntagmatic structure. Syntagmatic relations usually, but not necessarily, involve members of different grammatical categories which can co-occur in grammatically well-formed expressions (Lyons, 1995). (5) In addition to the four aforementioned categories, words in the mind are related by an intricate series of links to an encyclopedia of world knowledge gathered over many years. Encyclopedic knowledge relates words to the world, and brings in origins, causes, effects, histories, and contexts (McCarthy, 1990, p. 41). Therefore, the classification system adopted in this study involves the encyclopedic category to encompass this type of response.

Data analysis

Three measures were taken in the response classification to minimize the effects of subjectivity and maximize reliability of the sorting procedure. First, categories of classification were clearly defined in advance and rigorously followed in the analysis procedure. Second, some established norms were referred to, for example, in classifying paradigmatic relations, WordNet 2.0[iii] was consulted, and COBUILD Collocation Sampler[iv] was used to determine the relative strength of syntagmatic relations. Third, two analysts (both with a background in applied linguistics) evaluated each response and assigned it to one of the five categories. Initial inter-rater reliability was .91, with the classifications for the divergent responses settled by a third party. Since there were 40 stimulus words and each subject was expected to produce 40 responses, there were consequently a total of 2,000 responses (i.e. 50×40) from Year One, Year Two, Year Three and Year Four. As a result, the gross responses of the four groups were 8,000 (i.e. 2000×4). Each response was typed into computer both in its word form and in its category label. The statistical analysis in this study consisted of computing the frequency and percentage of each association category and calculating chi-squares with category as the dependent variable in order to compare the results among the

four different groups of subjects. Wordlist Tool in WordSmith was employed to analyze the frequency of responses.

RESULTS AND ANALYSIS

Table 1 gives the data in frequency and proportion for the five categories of the four groups of subjects.

Table 1 Frequencies and proportions of associations for the five categories of the four groups

	Year 1 (n = 50)		Year 2 (n = 50)		Year 3 (n = 50)		Year 4 (n = 50)	
	F	%	F	%	F	%	F	%
Paradigmatic	809	40.5	752	37.6	920	46.0	815	40.8
Syntagmatic	441	22.1	674	33.7	677	33.9	811	40.6
Encyclopedic	79	4.0	98	4.9	130	6.5	158	7.9
Clang-other	578	28.9	470	23.5	257	12.9	215	10.8
No-response	93	4.7	6	0.3	16	0.8	1	0.1
Total	2000	100	2000	100	2000	100	2000	100

Note. F = frequency

As can be seen in Table 1, word associations of the four groups of subjects disproportionably distributed in the five categories. For Year One subjects, the majority of their responses fell into the paradigmatic category, followed by clang-other responses, then followed by syntagmatic responses, no-response cases and encyclopedic responses. For the other three groups of subjects, a constant pattern could be detected as to the ranking of the five types of responses, that is, paradigmatic responses > syntagmatic responses > clang-other responses > encyclopedic responses > no-response cases. The rate of paradigmatic associations was highest among the five categories for all groups and it fluctuated between groups. In contrast to the fluctuation of paradigmatic responses in the four different stages, syntagmatic and encyclopedic responses increased with the accumulation of learning experiences, accompanied by a decrease in clang-other responses. No syntagmatic-paradigmatic shift was detected in this study.

A complete picture of the development of the subjects' lexical organization was provided by conflating all the occurrences of paradigmatic, syntagmatic, and encyclopedic responses into a "semantic" group and the clang-other responses and no-response cases into a "non-semantic" group. The main purpose of such conflation is to make the occurrences comparable between semantic links and non-semantic responses. Table 2 summarizes the occurrences and percentages of the two categories for the four groups of subjects.

Table 2
Frequencies and proportions of semantic and non-semantic associations for the four groups of subjects

	Year 1 (n = 50)		Year 2 (n = 50)		Year 3 (n = 50)		Year 4 (n = 50)	
	F	%	F	%	F	%	F	%
Semantic	1329	66.5	1524	76.2	1727	86.3	1784	89.2
N-semantic	671	33.5	476	23.8	273	13.7	216	10.8
Total	2000	100	2000	100	2000	100	2000	100

Note. N-semantic = non-semantic; F = frequency

As revealed in Table 2, Year Four subjects produced the most semantic responses (1,784 and 89.2%), while Year One subjects yielded the least semantic associations (1,329 and 66.5%). Those of Year Two and Year Three were somewhat in between (1,524 and 1,727 respectively). The opposite was true for the non-semantic responses, and subjects at higher learning stages tended to produce less such links (273 of Year Three and 216 of Year Four) than subjects in lower learning phases (671 of Year One and 476 of Year Two). To test whether such perceived differences are statistically significant or not, a Chi-square test was performed with the two response types as the dependent variables. The result showed that there was a significant difference in the frequencies of semantic and non-semantic responses among the four groups ($\chi^2 = 396.110$, $df = 3$, $p = .000$). To further examine the between-group differences, 12 corresponding Chi-tests were performed, and Table 3 presents the results of the tests including χ^2 values and p values.

Table 3
Chi-square tests of differences in the semantic and non-semantic responses across the four groups of subjects

	Semantic associations		Non-semantic associations	
	χ^2 ($df = 1$)	p value	χ^2 ($df = 1$)	p value
Year 1 vs. Year 2	13.328	.000	33.152	.000
Year 1 vs. Year 3	51.834	.000	167.801	.000
Year 1 vs. Year 4	66.503	.000	233.399	.000
Year 2 vs. Year 3	12.676	.000	55.019	.000
Year 2 vs. Year 4	20.435	.000	97.688	.000
Year 3 vs. Year 4	.925	.336	6.644	.010

The above table indicates that the semantically-based responses increased significantly ($p < .05$) from Year One to Year Three. Contrary to such seemingly linear increase, the development slowed down from Year Three to Year Four ($p = .336 > .05$). The pronounced tendency was that subjects with more learning experiences generated more semantically-based responses than those with less learning experiences. Such development however, stagnated

from Year Three to Year Four. The opposite was true for the non-semantic responses, that is, the frequencies of such associations decreased significantly from Year One to Year Four (p < .05). Concerning the overall development of lexical organization, a shift occurred from a more non-semantic pattern to a more semantic pattern from Year One to Year Four.

The above analysis seems to show that the mental lexicon will be organized on a more semantically-based pattern with increased proficiency and learning experience. Such an extrapolation is, however, difficult to maintain when we analyze the five categories of responses quantitatively and qualitatively.

Table 1 shows that no-response cases were the least among the five categories in the four groups. A closer study reveals that the subjects tended to produce no response to 28 out of 40 stimulus words with the occurrences of such responses ranging from 1 to 18. Eighteen subjects out of 200 were unable to generate any responses to PRIEST, and 14, 8, 7 and 7 subjects failed to make associations to STOVE, JOY, JUSTICE, and CHEESE. A reference to BNC word frequency lists revealed that the five words were somewhat low frequency ones compared with other prompt words in the association test. It is plausible to conclude that the learners often fail to respond to low frequency words, be they concrete words or abstract words. In addition to word frequency, such lexical traits as abstractness and culturally strangeness may exert influence on the type of responses. As concrete nouns, the frequencies of MOUNTAIN and LION were 68 and 21 respectively in BNC, lower than those of JUSTICE and JOY. No subject, however, failed to respond to MOUNTAIN and LION. Therefore, word frequency in itself may not account for the no-response category and the abstractness of word may play a role in learners' acquisition of words. To PRIEST, cultural strangeness may have a bearing on the response types. Hence a tentative conclusion drawn from the present data is that the learners are inclined to give no responses to low frequency words, abstract words and culturally unfamiliar words.

There was a general tendency in Table 1 for the rate of clang-other responses for subjects at higher learning stages to be much lower than that for subjects at lower learning stages. Each of the 40 stimulus words elicited clang-other responses, and the frequencies of such responses ranged from 11 to 85. Among the 40 words, the concrete and low frequency noun STOVE elicited the most clang-other responses (85 in total: 29 from Year One, 36 from Year Two, 14 from Year Three, and 6 from Year Four). Wordlist Tool in WordSmith was employed to examine what words were typical clang associations to STOVE among the four groups of subjects. This procedure revealed that *stone* was the most frequent one for the four groups of learners. Contrary to the clang responses to STOVE, the abstract noun COMFORT elicited another type of clang-other associations. To COMFORT, the highest frequency of responses was *comfortable* (51 occurrences out of 200, taking up 25.5% of all the responses), which was in the same word family with COMFORT. Similar pattern emerged for the stimulus words CHILD and

DEEP, to which subjects were apt to responding with *children* and *deeply* or *depth*.

As shown in Table 1, the rate of paradigmatic associations was highest among the five categories for all groups. A detailed inspection reveals that each of the 40 stimulus words elicited different numbers of paradigmatic responses, ranging from 9 to 154 occurrences. The top six prompt words inducing most paradigmatic associations were HEAD, FRUIT, HAND, MOUNTAIN, EARTH, and FOOT. It is obvious that all of them are concrete nouns. In contrast to the high frequency and concrete words, the low frequency words were inclined to elicit less paradigmatic associations. For instance, the stimulus words STOVE, MEMORY, PRIEST, and BUTTERFLY only elicited 9, 30, 31, and 36 paradigmatic responses respectively. A detailed examination of paradigmatic associations shows that the subjects at higher learning stages could produce more abstract and low frequency responses. The most frequent paradigmatic response to the stimulus word MUSIC is *song* for the four groups of subjects. Year Three and Year four subjects, however, generated such responses as *melody* and *rhythm*. The same tendency can be revealed with the stimulus word BUTTERFLY. The subjects in Year Three and Year Four were able to produce such responses as *worm*, *insect*, *dragonfly*, and *firefly*. Nonetheless, the subjects in Year One and Year Two failed to generate such words, indicating a mental lexicon with smaller vocabulary size and superficial vocabulary knowledge.

The number and ratio of syntagmatic responses were the lowest in Year One (441 and 22.1%), while those of the Year Four were the highest (811 and 40.6%). A close inspection of the different types of syntagmatic responses reveals that the higher ratios of syntagmatic responses at the upper grade levels were caused by a sharp increase in noun phrase associations. An investigation of these noun phrases indicates that subjects in higher learning phases responded not only with associations like those usually generated by the students at lower learning stages, but also with noun phrases of a higher level of abstraction and a lower level of word frequency. MEMORY was the prompt word which induced most syntagmatic responses (135 out of 200). To it, subjects at higher learning stages could make such responses as *temporary* and *valuable*. The most frequent collocate in the four different groups for the stimulus word CHILD was *lovely*. However, Year Three and Year Four subjects also produced *naïve*, *fragile*, *lively*, and *vigorous* as associations.

The subjects at higher stages generated more encyclopedic responses than those at the lower stages, though this type of responses occurred less frequently than the paradigmatic and syntagmatic responses. In addition to organizing mental lexicon paradigmatically and syntagmatically, encyclopedic knowledge was involved in structuring the subjects' internal lexicon. For example, to the stimulus word CARPET, the responses like *dignity*, *succeed*, *marriage*, *wedding*, and *bride* were associated with it. Another noticeable characteristic of encyclopedic responses is that quite a number of such responses stem from the subjects' specific cultural background. Since L2 may divide up experience in a different way from L1, the learners may generate

some responses reflecting their cultural specification yet deviating from the native speakers' norms. For example, YELLOW elicited such associations as *sex*, *unhealthy*, and *crime*. Such responses are invisible in the native speakers' association (Kiss et al., 1973; Postman & Keppel, 1970). In English, the word conveying this concept is BLUE rather than YELLOW, while huangse in Chinese entails *sex*, *unhealthy*, and *crime*. The meaning of the Chinese translation may be imposed on the English word YELLOW by the learners. It is likely that the L2 mental lexicon is structured with a mixture of the L2 meaning and that of L1 translation equivalents.

DISCUSSION

As to the syntagmatic-paradigmatic shift, this study does not bear it out. One possible factor may be that the shift has occurred before the learners reach the tertiary level since all stimulus words are common ones. Another possibility may be in line with Wolter's view. After a wide-ranging trawl through the literature as well as the results of his own experiment, Wolter (2001) points out that the so-called syntagmatic-paradigmatic shift is a misnomer. Based on abundant evidence, he further argues that the increase in paradigmatic responses is not offset by the decrease in syntagmatic associations but rather by a decrease in clang responses. The evidence in the present study confirms Wolter's viewpoint. Though the paradigmatic responses are dominant, the syntagmatic responses increase from Year One to Year Four. Consequently, this increase entails the decrease of clang-other responses and no-response cases.

The results indicate that the semantic responses increased and the non-semantic associations decreased from Year One to Year Four. L2 mental lexicon develops from a more phonologically-dominated pattern to a more semantically-dominated one when the learners move from an intermediate stage to an advanced stage. Despite the general development of lexical organization, three features of L2 learner' responses emerge from the results of the present study. First, clang associations are found among the responses of even the most advanced L2 learners. Second, a high rate of paradigmatic response is found among the responses of even the least advanced L2 learners. Third, a high degree of syntagmatic associations is found among the responses of even the most advanced L2 learners. The fact that clang-other association occurred at all four learning stages, even at more advanced stages of language proficiency, may indicate that phonology plays a fundamental role in the organization of the L2 mental lexicon and is not abandoned even at the advanced stages of language proficiency. Categorizing unfamiliar words phonologically may be among the first steps of word acquisition. Thus, the form-based feature of the organization of the mental lexicon is not a characteristic of the stage of language proficiency but rather a primary acquisition feature of every individual word (Namei, 2004).

An analysis of clang-other responses indicates that the L2 mental lexicon may not be well organized. The subjects in the four groups tend to respond

with the members of the same word families as the prompt words. However, as pointed out by Schmitt and Meara (1997), "native speakers do not normally give the members of a target word's family as association responses" (p. 20). It is likely that associations tend to be related to concepts rather than the form of words in L1 mental lexicon. This claim turns out to be true when referring to the Norms of Word Association edited by Postman and Keppel (1970) and the EAT (Kiss et al., 1973). For native speakers, their lexical entry contains semantic, syntactic, morphological, and formal specifications (Levelt, 1989). Members of the same word family are stored in one lexical entry. This particular lexical entry links with other lexical entries in one way or another in the mental lexicon. However, members of same word family may be stored separately in the L2 mental lexicon, which will impede the automatic use of words (Jiang, 2000, 2004).

As to the encyclopedic category, a detailed analysis reveals that some responses are closely related with L1 cultural specifications. As Jiang (2004) points out, the comprehension and production of L2 words are mediated by the L1 semantic system. Such mediation results in the fossilization of most L2 words. To fully acquire L2 words, learners have to establish a semantic system specifically for L2 words free from the influence of the L1 semantic system (Kroll, Michael, Tokowicz & Dufour, 2002). The process of semantic restructuring is indispensable and critical for learners to produce idiomatic English expressions.

CONCLUSION

This study investigated the development of L2 lexical organization by the word association test. The results show that learners at lower learning stages produce more non-semantic responses of clang-other and no-response types and less semantic responses of paradigmatic, syntagmatic and encyclopedic types than those at higher learning stages. As suggested by Carroll (1999), lexical organization and lexical retrieval are mutually dependent. The findings of this research show that the subjects even in advanced learning periods tend to organize their L2 mental lexicon in a phonologically-driven pattern, pointing to the necessity of establishing a meaning-based and web-like network of L2 internal lexicons to facilitate effective lexical retrieval. Network building, however, is a tortoise-like process (Aitchison, 1987). Words that a native speaker would regard as related take time to connect in the L2 learner's mind. The predominance of phonologically-based links will be a hindrance for fast word retrieval in natural communication. Therefore, the restructuring of L2 mental lexicon on a semantic or conceptual basis is of crucial significance to make the learners' lexicon conform as closely as possible to that of native speakers. A well-established mental lexicon rich in links will definitely promote efficient lexical use in communication.

However, this research is pseudo-longitudinal in which the learning product rather than the learning process is explored. What is more, the participants in the research are English majors from one university in China.

Therefore, the results can only generalize to populations that share the same characteristics as the participants in this investigation, and may not extend to other types of learners such as non-English majors or middle school students. Future study can be conducted longitudinally amongst middle school students or amongst English majors or amongst non-English majors to find out a more convincing developmental pattern of lexical organization. In addition, this study takes the high frequency words as stimuli. Further research can track the development of associations of newly learned words by adopting a microgeneric paradigm. Data of the associations can be frequently collected in several short intervals to reveal how new words are acquired and integrated into the existing lexical stock. In short, whether the developmental pattern of the L2 lexical organization as revealed in this study is a universal phenomenon or is limited to certain learner populations has yet to be explored.

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Notes

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[i] All stimulus words are given in upper-case letters, and responses or associations are in lower-case letters and italics.

[ii] The Edinburgh Associative Thesaurus (EAT) is a set of word association norms showing the counts of word association as collected from 100 native speakers of English. An interactive version and a downloadable version of the word association thesaurus are available over the Internet at <http://www.eat.rl.ac.uk>.

[iii] WordNet 2.0 is an electronic lexical database and an on-line lexical reference system developed by the Cognitive Science Laboratory at Princeton University under the direction of Professor George Miller.

[iv] COBUILD Collocation Sampler is an on-line demo facility that can show the 100 statistically most significant collocates of a word searched. The collocates are retrieved from a corpus of 56 million words of contemporary written and spoken text.