Evaluating Mental Lexicons of Native English Speakers and Native Japanese Speakers Through Word-Association Tests

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INTRODUCTION

Girl : Oh my God. He's got a knife ! Do what he says !
Crocodile Dundee : Knife ? That's not a knife. THIS is a knife !
-A *scene from the movie "Crocodile Dundee."*

Words are the heart of language. Without words, there is no sentence, no grammar, no discourse, no language. But what are words? And how are they (best) learnt? *Kuruma* (which means "car" in Japanese) is nothing more than a strange sound to someone who does not understand Japanese. But once a mental image, or meaning, is attached to the word, it is thought to be learnt. Words need meaning to be understood. And to teach the word *kuruma*, a teacher has to only point to an automobile and utter the sounds. Much learning and teaching happens this way. But as the example of Crocodile Dundee shows, one person's idea of a knife (or a car, or fun or anything) is not necessarily the same as another's. To Dundee, far from the swamps of Australia's Outback, the word "knife" conjures up a differ-

ent idea (meaning) than it did for the terrified city girl he was protecting. Our students, too, undoubtedly have their own ideas, and assign meanings in ways different from native speakers. It is important that teachers not only understand that this exists, but also try to understand the nature of lexical acquisition by their students.

Any discussion on the mind, learning or lexis must begin with the cautionary disclaimer that it is extremely difficult to make firm conclusions about mental processes. Linguists still know very little about how we learn. But human behavior has long provided behavioral scientists clues as to the workings of the mind, as has language usage provided clues to the linguist.

Word association tests have often been employed to provide clues to how people organize in their minds the tens of thousands of words in their language, and what meaning they attach to those words. And though they are an imperfect measuring device, linguists and scholars use word association tests because the results often show a consistency and a pattern that reveals an inner organization, or what is known as a mental lexicon. Better understanding of how language is processed, stored, retrieved and produced, would directly impact the pedagogic beliefs that currently influence the development of syllabi, methods and materials.

Although most of us would never dispute that our learners do not always think like us (I speak for Westerners teaching in Japan), do many of us inquire about the nature and depth of these differences, and how it affects our teaching? That our students have a fully developed L1 mental lexicon, with its attending cultural, social and psychological attachés, raises a question: When learning a second language, does a separate mental lexicon develop? If so, how closely does it resemble the L1, if at all?

LITERATURE REVIEW

Different researchers disagree on the current standing of vocabulary within the English language teaching profession. Lessard-Clouston (1996, p. 25) writes that "an examination of many current, commonly used ESL and EFL texts reveals little systematic focus on English vocabulary learning and development." Nunan (1995) notes the lack of research devoted to how lexical competence is achieved. Carter (1987) and McCarthy (1990, p. 51), however, say that advances in linguistic and psycholinguistic theory and procedure has positively affected vocabulary pedagogy. Computerized corpuses, such as The Collins COBUILD English Language Dictionary, has enabled teachers and researchers to investigate language in greater detail and more efficiently.

Results of word association tests have revealed that "word associations produced by non-native speakers differ fairly systematically from those produced by native speakers" (Meara in Carter, 1987, p. 159). Responses by non-native speakers have greater variety and less predictability than native speakers. Anglin (1970) and Aitchison (1994, p. 83) found that people (native speakers) "almost always choose from the same semantic field... almost always choose the partner from one of a pair (big-small)," and that noun referents "elicit nouns, adjectives elicit adjectives, and so on." But Channell (in McCarthy, 1990, p. 35) warns that "we should not necessarily assume that the mind organizes the lexicon of a second language in the same way as it does its first." Piper and Leicester (1980) found "significant differences" between beginner ESL students and native speakers (though these differences diminished between advanced ESL learners and native speakers).

From these tests, many models have been constructed in an attempt to

understand how the mind might work lexically. These models involve categories the mind uses to organize and store words.

The theory of structural semantics suggests a basic model for word associations. Its premise is that words are not fixed, isolated entities. They derive their meanings through the context in which they appear, and the sense relations they share with the words around them. McCarthy (1990, p. 16) says that "the sense relations (of structural semantics) which most language teachers encounter with the greatest frequency in day-to-day teaching are synonymy, antonymy, and hyponymy." Carter, as well, says that "typical responses" to word association tests involve the sense relations (Carter, 1990, p. 19). Two fundamental ways that words relate to each other in this model is by their likeness (synonymy) or the oppositeness (antonymy) to each other. Synonymy refers to different lexical items that have the same meaning in a conceptual or propositional way (Carter, 1990). For example, in the sentence "what a (n) _____ game!" choosing either "incredible" or "fantastic" maintains the propositional meaning.

Carter (1990) identified various subsets of antonymy. "Complimentary antonymy" refers to the mutual exclusiveness between items: you are either dead or alive; you're either pregnant or you're not. The oppositeness is not gradable. "Converseness" refers to the dependence an item has to an opposite, without which it cannot exist. For example, "brother-sister." Without the existence of a sister, one could not be a brother. "Incompatibility" refers to "relational contrasts between items in a semantic field...It occurs in such sets as seasons, days of the week, generic types, etc." (Carter, 1990, p. 19). Antonymy refers to two opposite items whose oppositeness is gradable, for example, big-small, hot-cold and so on.

A third sense relation is known as hyponymy. Hyponymy refers to the location an item holds within a hierarchical structure. In hyponomy, "the

meaning of the specific item is included in and by the meaning of the more general item" (Carter, 1990, p. 20). Within hyponymy, items are naturally either part of a greater whole (subordinate), or subsume a lower item within its structure (superordinate). For example, "food" is the superordinate of "vegetable." "Squash" is a subordinate item to "vegetable." Taxonomies is another term for items related in a subordinate and superordinate manner. The taxonomy ladder can be long, with associations that are obvious (hospital-doctor) or seemingly dubious (hospital-trees). McCarthy (1990, p. 20) notes the existence of taxonomy-like relations in all languages and that the "presentation of semantically-related items can assist learning and retention."

There are other theories which attempt to describe how people assign meaning to items, and organize them in a way that allows for efficient comprehension, recall and production. These theories allow for a less polemical view of the mental lexicon than structural semantics. One such theory is that of cognitive domains. Cognitive domains include basic and abstract domains. The basic domain is the inherent features or qualities of items (such as size, shape, temperature and dimensions) that are readily apparent to most people. For example, hurricanes have strong winds and a lot of rain, and last for a day or more. Abstract domains involve knowledge beyond the basic domain (hurricanes are seasonal, people sometimes must evacuate their homes, they occur in the tropics, etc.) "Basic domains are universal, but abstract domains may differ from culture to culture" (McCarthy, 1990, p. 47).

Another theory is found in the idea of prototypes. Prototype theory suggests that when people categorize items "they seem to have some idea of an ideal exemplar" (Aitchison, 1994, p. 55). Some things are sufficiently close to the prototypical 'x' to be considered associated. "A robin is

considered a prototypical bird, more so than a dove, which is closer to the prototypical bird than a parrot, which is closer than a penguin, and so on." (Aitchison, 1994, p. 71).

Moran (cited in Piper and Leicester, 1980, p. 2) note how responses are either "enactive" in that they "act upon the referent," "logical," (synonymy, antonymy, etc) or "iconic," which gives certain qualities to the referent.

Paradigmatic and syntagmatic classifications are another way of categorizing word associations. Paradigmatic associations are those in which the response word shares the same grammatical class as the referent *(tree-bush, plant)*.

As with any kind of research, there are limitations to what results of word-association tests can tell us about mental processes. Meaning is determined by the context in which the word is set, and a word without a context is liable to have various meanings. Putting a word into a sentence, or displaying it next to other words or pictures, can change the association one has with the word and thus change its meaning (Anglin, 1970, Aitchison, 1994, p. 4).

It is the purpose of this research to identify similarities and differences in the way Japanese respond to word association tests in Japanese and in English, and to determine how these mental associations compare with what is known from word-association tests that have been given to native English speakers.

RESEARCH PROJECT - SUBJECTS AND METHODS

I administered word-association tests in two phases over the course of two weeks in July-August, 1997. Respondents in the first phase were Japanese speakers of English, whose English level would be considered

"intermediate" to "high intermediate." These respondents were both male and female, from 19 years-old to early 40s. They were given 30 seconds to respond orally in English to English words given orally. Respondents in the second phase responded orally in Japanese to Japanese prompt words given orally. In this second phase, I chose to let trusted Japanese friends administer the test. There were two reasons for this. First, as a non-Japanese, I might "contaminate" the natural L1 thought process of the respondent. Second, I would not likely understand all the responses given in Japanese. I made sure that my friends followed my procedures closely to ensure consistency. Respondents in the second phase were unaware that this exercise was related to English in any way.

I chose 10 words, mixing in nouns, adjectives and verbs. The words were: fruit, hospital, hobby, big, see, pet, glass, drive, fast, China, and doctor.

I chose to compare the findings with a structural semantic model because, first, according to McCarthy (1990), teachers most frequently encounter this in the classroom, and second, because of Carter's idea of the fundamental nature of this model as a way to view the mental lexicon. I also chose to use the categories proposed by Carter (1987, p. 19) because the way he subcategorized "antonymy" allowed for a more detailed analysis. However, I will refer to these, borrowing from Moran, as "logical" responses. Logical responses, for the purpose of this paper, are synonymy, antonymy, and hyponymy. Within hyponymy are "subordinate" and "superordinate" relations. The subsets of antonymy, according to Carter, are "complementarity, converseness, incompatibility, and general antonymy."

However, as the research findings will show, a different categorization strategy was needed to do meaningful analysis of respondents' mental

association. So I created what I will refer to as a "Collocate-Paradigmatic Associations (CPA)" scale, which categorizes collocate responses into six categories. The categories reflect Anglin (1970) and Piper and Leicester's (1980) findings that word associations can be viewed from their grammatical, syntagmatic or paradigmatic nature. The CPA may not necessarily be the best way to categorize collocates, but it is a logical approach in making sense out of the many kinds of responses (especially lacking a corpus data base). The first two of the six categories are "Act Upon" and "Acted Upon." These associations usually involve responses to verb referents. Act Upon means that the referent "does something" to or with the prompt (*car-drive*). Acted Upon is the idea of the response word having something "done to" it by the referent (*see-television*). The next two categories, "Physical" and "Judgment" generally involve adjectives as either the referent or response. Physical is an association by physical sense perception. It involves associating with a referent via one of the five senses or associating with the physical properties (dimension, color) of the item (apple-sweet; building-big). Judgment closely relates to Physical, but is more subjective. Judgment involves a respondent's opinion of the referent (*doctor-fair ; hobby-interesting*). The last two categories are "Associated Activity" and "Associated Item," and involve activities and items that respondents associate with the referent (*hospital - helps people,* and *drive-trip*).

RESEARCH FINDINGS

ANALYSIS OF "LOGICAL" CATEGORIES: For noun referents, subordinate responses in L1 were more frequent than those in L2. Subordination in the L2 remained strong — but less strong than in the L1. Only responses

to "China" violated this pattern of L1 subordinate clustering. Interestingly, *hospital* was the only noun referent not to draw a logical response. Item responses were stronger in L2 than L1 for noun referents. There was generally an inverse relationship between subordinates and items: where the L2 was weaker vis-a-vis the L1 in subordinate responses, it was stronger in item responses.

Verb referents drew very few logical responses. The adjective referents drew more logical responses than the noun or verb referents combined. Synonym responses in both L1 and L2 for *fast* and *big* were strong.

Response from the CPA categories, in both L1 and L2, accounted for the majority of the responses. The strongest CPA category overall was items. The number of responses in the other CPA categories combined did not equal the total number of responses from the item category.

ANALYSIS OF CPA CATEGORIES. All but one referent (*big* in L1) associated -- usually strongly -- with item. And in six of nine cases under item, an L2 response was more frequent than an L1 response. For example, only *China*, *see* and *fast* (all from different word classes) had more frequent L1 responses than L2. Responses to the verb referents (see and drive) were very different. For the referent *see*, the L2 response was strong but the L1 response was somewhat weak.

ANALYSIS BY WORD CLASS CATEGORIES. All referents, regardless of word class, drew heavy noun responses. Usually this amounted to seventy percent or more of both L1 and L2 responses to each referent. Normally, there was little difference between the percentages of L1 and L2 noun responses. One exception to this is found among the responses to adjective referents. L1 noun responses (92%) to *fast* were far greater that

than in the L2 (68%). However, with the adjective referent *big*, the percentages were virtual opposites: the L2 noun response (91%) greatly exceeded the L1 noun response. The remaining responses to these two different adjective referents fell almost exclusively into different word class categories: The alternative responses to *fast* were mostly verbs, but the alternative responses to *big* were adjectives. The L2 verb response for *fast* (24%) was greater than in the L1 (8%), but the L1 adjective response to *big* (33%) was greater than the L2 adjective response.

Verb responses, in most cases, were more frequent in L2 than L1.

Noun-like verb responses occurred mainly for one referent: *hobby*. Such responses to *hobby* were far greater in L2 (43%) than L1 (7%). Hobby also was the only referent to draw responses in both L1 and L2 from each word class response category.

TABLE 1
ANALYSIS OF WORD ASSOCIATIONS - ENGLISH

	CPA: Collocation-Paradigmatic Associations						Logical Categories				
	Act Upon	Acted Upon	Physical	Activity	Item	Opinion	Subordinate	Superordin	Synonym	Antonym	Coordinate
FRUIT-Eng.	—	—	11%	—	11%	—	78%	—	—	—	—
Japanese	—	—	3	—	6	6	86	—	—	—	—
HOSPITAL	—	—	—	5	84	11	—	—	—	—	—
Japanese	—	—	—	21	71	8	—	—	—	—	—
HOBBY	—	—	—	6	15	26	53	—	—	—	—
Japanese	—	—	—	4	4	15	70	—	—	7	—
PET	5	—	—	5	13	—	73	5	—	—	—
Japanese	7	—	—	—	4	4	80	4	—	—	—
CHINA	—	—	10	7	62	7	10	3	—	—	—
Japanese	—	—	4	—	96	—	—	—	—	—	—
SEE	—	71	—	4	11	—	—	—	4	—	—
Japanese	—	46	—	21	25	—	—	—	4	—	8
DRIVE	3	20	3	34	31	9	—	—	—	—	—
Japanese	—	37	—	7	27	30	—	—	—	—	—
FAST	23	—	—	3	6	52	—	—	13	3	—
Japanese	4	—	—	4	19	65	—	—	8	—	—
BIG	—	—	—	—	23	67	—	—	7	3	—
Japanese	—	—	—	—	—	74	—	9	9	3	—

Note: For convenience of comparison, the order of referents is listed differently than how they were administered during testing. All percentages rounded.

TABLE 2
ANALYSIS OF WORD ASSOCIATIONS BY WORD CLASS - ENGLISH

	NOUN	VERB	NOUN-LIKE ADJECTIVE	VERBS
FRUIT-English	89%	—	11%	—
Japanese	90	—	10	—
HOSPITAL	85	—	15	—
Japanese	86	—	7	7
HOBBY	31	11	14	43
Japanese	85	4	4	7
CHINA	83	—	17	—
Japanese	75	—	25	—
PET	88	13	—	—
Japanese	91	9	—	—
SEE	88	9	3	—
Japanese	83	13	—	4
DRIVE	78	14	8	—
Japanese	72	—	28	—
FAST	68	24	6	3
Japanese	92	8	—	—
BIG	91	—	9	—
Japanese	67	—	33	—

Note: For convenience of comparison, the order of referents is listed differently than how they were administered during testing. All percentages rounded.

DISCUSSION

Before discussing the specifics of the research findings, one major finding, and its consequence on the type of analysis contained in this report, must be addressed. The finding is that most of the responses to the word associations fell outside of the structural semantic categories put forth by Carter (1987), requiring that a different set of categories be developed for a meaningful analysis and discussion to take place. What was needed were categories that reflected the cognitive domains of the respondents. For example, a careful review of the responses showed a strong sense of "involvement" and "doing" with the referent; *doctor* yielded *see a patient* and *waiting room*. *Pet* yielded *take care of* and *care for*. *Fruit* yielded *after dinner* and *desert*. *Drive* yielded *sea* and *holiday*. These responses suggest a mental process that associates a referent with an activity that one does with the referent. Responses should be analyzed according to these cognitive factors, in addition to logical categories. It is not the purpose of this paper to use this data to investigate how cultural and knowledge factors -- the cognitive domain -- assign meaning to words, but a brief discussion would be helpful before moving ahead. The meaning that words are "given" often depend on the local culture, geography, life-style and so on. For example, in this study, respondents strongly associated the referent *car* with *sea, mountain* and *holiday*. Why? In my town, and in much of Japan, cars are luxury for young people, unlike in Western countries that consider driving either a necessity or a right. In Japan, most students do not have drivers licenses, or if they do, do not own their own cars. And when they use a car, it is likely not to be for the same purposes as Westerners. For the respondents who are college students, their involvement with cars involves primarily recreation (outings to the sea

or mountains, either with their families while growing up, or presently with friends and boyfriends) rather than commuting or general transportation, as might be the case with a Western (or, at least, American) student.

Findings showed two things: that Japanese responses in both L1 and L2 fell outside the logical categories (synonymy, antonymy and hyponymy) in most cases, and that Japanese subjects' L1 and L2 response patterns in were similar, *in that the categories from which responses came from showed consistency*. However, the percentages within each category often differed. This has two possible explanations: that the mental lexicons of the L1 and L2 are constructed separately but similarly, or that the L2 develops from the L1, but looks different depending on the respondent's fluency.

That Japanese subjects' responses differed from what is known from native speaker responses agrees with the research cited earlier that found non-native response patterns to be very different from native speaker responses patterns. For Japanese subjects, synonymy, antonymy and hyponymy were infrequent responses in most cases. Some referents associated almost exclusively with subordinate items. For example, *fruit* associated with words such as *apple*, *orange*, and *watermelon*, and *pet* produced such responses as *dog*, *cat*, and *bird*. The lack of a clear antonym or superordinate to *pet* might explain the heavy subordinate response in that case. But in the case of *fruit*, antonyms and superordinates would be entirely reasonable (i. e. *vegetable, food*). However, not one student responded like this.

Also, Japanese subjects did not, as do native English speakers, respond to referents with words from the same word class. They generally responded with nouns, regardless of the word class of the referent. In this way, the findings did not agree with other research that found a high degree of variety in the responses of non-native speakers.

Analyzing the responses according to word classes shows that Japanese speakers, like native English speakers, respond according to word class, but with some notable exceptions. Adjective prompts associated with *nouns*, rather than with other adjectives, as research with native English speakers suggests. Verbs also associated with nouns, rather than other verbs.

The nature of the referent often determines the type of response. That *hospital* was the only noun referent not to draw a subordinate response might seem significant at first glance, but the referents which drew strong subordinate responses (*fruit, hobby, pet*) are the type of nouns which fit easily into a hierarchical semantic structure, which defines hyponymy. That neither L1 nor L2 respondents associated hospital with a logical category reveals the similarities among the L1 and L2 mental lexicons. But that the respondents had different associations within CPA categories suggests that differences do occur in the mental storage and processing of lexis of different languages.

The nature of verbs, like nouns, can also influence associations that are made. Responses to the verb referents (*see* and *drive*), for example, were very different. The L2 response was strong for *see* but the L1 response was somewhat weak. This could be attributable to the nature of the verbs. Seeing is an unconscious act inherent to all non-blind humans. Driving is a learned skill and contains many associations with life experiences. Thus, few respondents associated *seeing* with an activity, in English. However, it scored much stronger in L1. This could suggest a difference in either lexical ability, or a difference in the organization of L1 and L2 mental lexicon, in the case of verbs with different natures (those of an unconscious nature versus those of a learned skill).

Like the noun referents *fruit* and *pet*, the adjective referents *big* and

fast elicited uniform responses, usually as nouns described by the adjective. Adjectives, by their nature, are incompatible with the concept of hierarchy and inclusion that defines hyponymy. Antonymy and synonymy are likely responses (as research among native speakers has shown), but the preference for Japanese to respond with opinions shows that Japanese associate things with an adjective while native speakers are more likely to associate the referent with synonyms or antonyms.

CONCLUSION and RECOMMENDATIONS

The results of this study show clearly that the Japanese mental lexicon differs from that of the native English speaker, but the ways in which it differs seem illogical and contradictory. Further research which identifies more (seemingly) illogical response patterns might provide clues as to second language acquisition, or certain pedagogic practices taking place in Japan. Certainly the tendency for these subjects to respond so overwhelmingly with noun responses suggests either a lack of lexical sophistication, or a dominant connection with the L2 mental lexicon.

New categories are needed to better analyze word association responses. The categories of structural semantics do not apply in most cases. A systematic method for categorizing the kind of "involvement" and "activity" that the respondent associates with the referent would yield a detailed map of how lexical items are stored and processed. This is where computers could prove beneficial. Just as computers have helped researchers uncover or explain certain grammatical and collocational patterns, computers too could and should be used to sort responses. Responses and referents could be tagged, sorted and cross-referenced, allowing for a broad-based analysis (and cumulative data-base) and new

models to be developed.

In replicating this study, some changes are recommended. Use a better balance of verbs and adjectives, and choose these referents with the knowledge that verbs differ. Also, to arrive at a more convincing comparison, use the same subjects to prompt for L1 and L2 response words. The L2 respondents in my survey differ from the L1, because of my poor language ability. The evidence would be less circumstantial.

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