Examining English L1 and L2 Word Association
Test Responses:
A Pilot Study in Japan

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Abstract

   This pilot study, following a design proposed by McCarthy (1990), compares the types of responses given to a word association test (WAT) by native (L1) and non-native (L2) English speakers residing in Japan.   The results found little difference between the two groups in the types of responses to the prompt words, with syntagmatic responses being most common, followed by world knowledge, paradigmatic, and phonological.   However, these results differed from previous studies such as Anglin (1970) who reported that adults produce predominantly paradigmatic responses, as well as Yoneoka (1987) who found that Japanese English speakers produce more syntagmatic responses than native English speakers who produce more paradigmatic ones.   In addition, native English speakers in this study differed from those in previous studies (Aitchison, 2003) by not producing responses of the same word class, as well as by responding to English prompt words with Japanese responses.   This may be caused by L2 interference with the English L1 due to immersion in a Japanese environment.

Introduction

   The question of how humans form words, how we choose which words to use from our vast collection of vocabulary, and how we arrange them to communicate effectively, has long fascinated researchers.   In addition, the unique word formation challenges facing bilinguals and multilinguals are of interest for both the insights into the human mind as well as their pedagogic implications.   As Carter (1987, p. 158) states, "...unless satisfactory answers are obtained to the question of what it *is* that learners *learn* when they acquire new words in other languages, then teaching procedures will be to some extent a hit-and-miss affair."

   With this in mind, I will describe how word association tests (WAT) can be used to gain insight into how foreign language (L2) learners, specifically Japanese advanced English learners, differ from native English speakers in terms of mental links that occur

during word formation.

Mental links with words

There are many ways to gain insight into human lexical mental processes.   These can include the examination of people with speech disorders, looking at errors in word formation that occur in normal individuals, brain scans, linguistic research, and psycholinguistic experiments (Aitchison, 2003).   Researchers have been able to gain insight into which brain areas affect different aspects of speech by looking at the speech difficulties of individuals who have experienced damage to various areas of the brain such as from a stroke.   Similarly, brain scans such as functional MRIs can show researchers which areas of the brains of individuals are active during the various stages of word comprehension and formation.   Furthermore, the occasional slips of the tongue and other speech errors, where the normal steps of word formation break down, can point to the mental processes in word formation.   There are also insights to be gained from linguistic research such as the examination of databases in corpus linguistics to determine word associations and patterns in spoken and written samples.

These techniques all provide valuable clues that increase our understanding of how humans form language, however, they also present many challenges.   For instance, there are few individuals with language specific brain damage to study.   Also, brain-scanning technology is expensive and not easily accessible for most researchers.   Slips of the tongue often occur few and far between, thus making collection of data more difficult.   In addition, linguistics research such as corpus linguistics requires access to the appropriate technology and sufficiently large and varied databases.   For these reasons, psycholinguistic tools such as the word association test (WAT) may be preferred by researchers.

Word association tests

Since its invention by Francis Galton over a hundred years ago, the word association test (WAT) has been employed by both psychologists looking to gain insight into the subconscious mind of patients, and by linguists seeking clues regarding how mental links are formed between words (Aitchison, 2003).   The main advantage of this technique is its simplicity.   WATs involve a subject being presented with a stimulus (prompt) word and recording the first word that comes to their minds.   The responses can then be analyzed to see if any patterns emerge.

The research question

This paper looks at task 123 (reproduced in the table below), outlined on page 152 of McCarthy (1990), with some modifications.

Table 1. Adaptation of Task 123 of McCarthy (1990, p. 152)

> **Aim:** To explore the relationship between word-association and learners' lexical development.
>
> **Resources:** A list of test items.
>
> **Procedure:**
>
> 1) Draw up a list of six to eight words to be used as stimuli in a simple word-association test.   Try to vary the test items, to include:
>
> – at least one grammar/function word (e.g. preposition, pronoun).
>
> – one or two items from the everyday physical environment (e.g. 'table', 'car').
>
> – a relatively uncommon or low-frequency word but one which your students will nonetheless know (this will depend upon the group's level: elementary-level students might require a word like 'drink', but an advanced group can probably cope with a word like 'surrender'; your own experience will tell you what is suitable).
>
> – a mix of word-classes (e.g. noun, adjective, verb).
>
> 2) Deliver the test to the study subjects, asking them to write down the very first word that occurs to them when each item is heard.
>
> 3) Gather in the results and see if any patterns emerge from the responses.
>
> **Evaluation:**
>
> 1) Does such a word-association test tell you anything about how subjects are making mental links between words they have learnt?
>
> 2) Do the results bear out the characteristic types of response discussed in 3.2 (see note)?

Note: The "characteristic types of response discussed in 3.2" are coordination, collocation, superordination, and synonymy (see also Aitchison, 2003) along with phonological and encyclopedic responses to stimulus words.

Types of word associations

There are a number of different types of word associations that have been identified by various researchers (e.g. Aitchison, 2003; Carter, 1987), some of which appear by different names in the literature.   I have focused on four general categories (syntagmatic, paradigmatic, phonological, and world-knowledge), both for the sake of simplicity and as these demonstrate the most fundamental differences in mental associations.

Syntagmatic

Syntagmatic associations (sometimes referred to as collocation) refer to words that can form a chain or phrase.　These words will elicit others that could occur shortly before or after it in a sentence.　This can include lexical and grammatical collocations as well as multi-word items such as proverbs, idioms, and clichés.　Syntagmatically associated words are often from a different word class than the stimulus word, such as a noun prompting a verb in response.　For example, the word PLAY could elicit "baseball" or "children".

It has been found that children are more likely to make syntagmatic associations in WATs, whereas adults predominantly make paradigmatic responses (Anglin, 1970, cited in Carter 1987, p. 150).

Paradigmatic

Paradigmatic associations are ones where the prompt word elicits an alternative word choice.　There are a number of subcategories including synonymy, hyperonymy, hyponymy, co-hyponymy, and types of antonymy such as complementarity, converses, gradable antonyms, and mutual incompatibles.

It should be noted that there are other classifications within paradigmatic that have been proposed.　For example, Aitchison (2003, p. 86) lists synonymy, superordination, and coordination.　Superordination is equivalent to the category described below as hyperonymy, while coordination overlaps with antonymy and co-hyponyms.

Carter (1987) points out that paradigmatic responses are typically of the same word class as the stimulus word.　For example, a noun such as DOG would elicit another noun such as "cat" or "animal".

Synonymy

Synonymy is where two words are similar in meaning such as TEST and EXAM, although they are not always interchangeable.　Thus while you can take an EXAM or take a TEST, you can't EXAM someone's abilities.

Hyperonymy, hyponymy, and co-hyponymy

Hyperonymy and hyponymy refer to a superordinate/subordinate relationship between words.　For example, ANIMAL (a hyperonym) is superordinate to DOG (a hyponym), while DOG and CAT are co-hyponyms as they are both subordinate to ANIMAL.

Antonymy

Antonymy deals with opposites and contains several sub-categories. For example, complementarity deals with mutually exclusive opposite pairs such as DEAD and ALIVE or MALE and FEMALE. Gradable antonyms on the other hand, refer to opposites on a scale such as HAPPY and SAD. While you can't be slightly dead or very dead, you can be very HAPPY or slightly SAD.

Converses are pairs where one word implies the other such as BUY and SELL, because if one person buys something someone else must have sold it to them.

Finally, mutual incompatibles refer to words that are not opposites but whose presence excludes others. For example, APRIL excludes the possibility of OCTOBER. Although it should be noted that this is similar to hyponymy as APRIL and OCTOBER are co-hyponyms of MONTH. Also, many antonyms are found in syntagmatic idioms such as "wanted dead or alive" which can make their classification somewhat subjective.

Phonological

Phonological associations (sometimes referred to as clang) are ones where the stimulus word elicits a word with a similar beginning or ending sound. An example of this is the stimulus word HE eliciting "heat" which shares the same beginning sound. This association is thought to be most common among children and low-level L2 learners (Carter, 1987).

World-knowledge

Also called encyclopedic knowledge, this final category is somewhat of a catch all for words that don't fit into the above categories. This is due to the personal experiences of the subject causing the associations as opposed to any linguistically related reason. An example might be SUN eliciting PAIN because of a history of sunburns in the individual.

Differences between Japanese English learners and others

Yoneoka (1987) found that Japanese adults tended to make more syntagmatic associations, both in their L2 (English) and their native Japanese, whereas adult American native English speakers gave predominantly paradigmatic responses. Yoneoka also reported that both American and Japanese children aged 3–5 gave predominately syntagmatic

responses, whereas by age 8–12 children had developed the same word association tendencies as either American or Japanese adults.　Yoneoka (2001) subsequently found a preference for syntagmatic responses in Korean ESL students as well as Japanese, which contrasts with the strong paradigmatic preference shown by European ESL learners. Yoneoka theorized that this could be due to the structure of the Japanese and Korean languages.

Experimental design

In designing the study it was important to consider both which subjects to examine, and which prompt or stimulus words to present them with.

The subjects

The subjects in this study form two groups.　The first group consisted of Japanese English-teachers (N = 8) who can be considered advanced learners.　The second group comprised native English-speaking English-teachers (N = 14) living in Japan, with a length of residence between one and five years.　Subjects from a number of different majority English-speaking countries (Australia, Canada, Singapore, the U.K., and the U.S.A.) were selected in order to minimize any culturally specific English that could skew the results. All but one of the native speakers has some foreign language ability, although only three were bilingual (in Portuguese, Korean, and Malay).

Japanese and native English teachers were the focus of the study because they both have similar educational levels and employment backgrounds, thus making comparisons between them easier.

Selecting the words

According to the task as outlined by McCarthy (see Table 1), words were selected to represent a mixture of word class and frequency.　According to Collins Wordbank Online, the grammar/functional words such as HE and WITH have the highest frequencies, while SURROUND has the lowest followed by CHAIR and BEAUTIFUL.

Experimental conditions

The words in Table 2 were presented orally to the native speaker and advanced

Table 2. Prompt words utilized

Prompt Word	Class	Frequency
PLAY	verb/noun	395320
CHAIR	noun/verb	36127
BOOK	noun/verb	170805
SURROUND	verb	31093
WITH	preposition	3213747
HE	pronoun	3650248
TEST	noun/verb	120526
BEAUTIFUL	adjective	36533
CAR	noun	175546

groups, and the subjects were interviewed individually. The purpose of the study was explained and examples of possible responses to the word SUN were given. Notes were taken of what reasons, if any, were given for choosing a particular word, as well as if the subject misunderstood the prompt word. The surveys for the native speaker and advanced L2 learner groups were conducted in a variety of locations due to subject's time constraints. The test was piloted and it was found that "extinguish" wasn't understood by many of the Japanese subjects, and so was dropped and the word "surround" used instead. If a subject didn't understand a stimulus word it was repeated, but not explained. The reasoning behind this was that the explanation may influence the response given by the subject.

Results

The results of the WATs were classified by type of word association. Although the subcategories of paradigmatic responses (synonyms, antonyms, hyponyms, and co-hyponyms) were recorded (see appendices 4 and 5), they were combined into a single paradigmatic category during analysis for the sake of simplicity. In addition, the prevalence of phonological associations was specifically examined for each group, as well as the most frequent responses to each prompt word. The responses were then examined for differences in word association type in relation to the subjects' language background.

Difficulties in classification of responses
In classifying the responses to the WAT, it immediately became apparent that there is

a degree of subjectivity and arbitrariness on the part of the researcher that is difficult to overcome (see appendices 4 and 5 for classifications of all responses).   For example, if a respondent replied "white" when presented with BLACK, is this a paradigmatic response where a choice is made between two colours, or is it a syntagmatic response to the expression "black and white" photograph, world-view, etc.?   While paradigmatic responses are typically of the same word class (nouns elicit other nouns for example), many words (including some used as prompts in this experiment), can belong to different word classes based on the context.   For example, PLAY can be a verb (I play baseball) or a noun (I saw a play at the theater) and since WATs only provide one additional word for context, classification can be subjective.   This can somewhat be alleviated through post-survey interviews with the participants to determine their intentions.   However, subconscious associations by their very nature can prevent participants from being consciously aware of why that particular word sprang to mind.   For example, one subject could offer no rationale for why the word HE elicited the word "moose".

Then there is the additional problem of dealing with L2 learners, as specific knowledge of their linguistic development and cultural norms may not be immediately apparent to the researcher.   An example of this would be the response of "swim" to the prompt word PLAY.   While it might be possible to classify this as a paradigmatic response, many low-level Japanese will say "play swim" the same way they would say "play baseball", hence it could be classified as a syntagmatic response.   Thus, while every effort was made to be

Table 3.   Percentages of responses for individual prompt words by advanced (Adv.) and native (Nat.) groups for different types of word-association.

Prompt word	% Syntagmatic		% Paradigmatic		% Phonological		% World-knowledge	
	Adv.	Nat.	Adv.	Nat.	Adv.	Nat.	Adv.	Nat.
PLAY	75	79	0	7	12	7	12	7
CHAIR	63	57	37	14	0	0	0	29
BOOK	88	86	0	7	0	0	12	7
SURROUND	25	93	0	0	0	7	75	0
WITH	88	71	13	29	0	0	0	0
HE	13	14	75	50	0	14	13	21
TEST	75	64	13	7	0	7	13	21
BEAUTIFUL	75	71	0	14	0	0	25	14
CAR	75	43	25	7	0	0	0	50

Note: See Appendix 3 for the total number of responses in each type of category to the prompt words.

Table 4. Percentage of total responses by type of word-association by group

Type of word association	Advanced	Native
Syntagmatic	63.9	64.3
Paradigmatic	18.1	15.9
Phonological	1.4	4
World-knowledge	16.7	16.7

consistent in the application of labels to different responses, other classifications may be equally valid.

Finally, the decision was made to place non-English responses into the category of world-knowledge.   This is because another language is something that is related to the subjects' specific knowledge as opposed to relationships between English words themselves.

Types of associations

The responses can be classified into the characteristic types of responses discussed in section 3.2 of McCarthy (1990) (appendices 4 and 5).   The most common association made (Table 4), regardless of the subjects' English level, was syntagmatic.   Next came world-knowledge closely followed by paradigmatic, and finally phonological.   This contradicts the findings reported in Anglin (1970, cited in Carter, 1987), who noted a predominance of paradigmatic responses in adults, as well as Aitchison (2003, p. 86), who found that the most common type of response was coordination (a type of paradigmatic response) followed by collocation (syntagmatic).   While the predominance of syntagmatic responses in the Japanese advanced L2 group corresponds with the findings of Yoneoka (1987), the low level of paradigmatic responses in the native speaker group is surprising.

The role of phonological similarities at different levels

Phonological associations were the least likely to occur regardless of English ability (Table 4).   Also, there were no phonological associations detected at all for several prompt words (Table 3), although occasionally phonological associations were detected in both subject groups.

Word choice differences between groups

While the WAT tests found similar types of word choices among both groups (Table

Table 5.　A comparison of the most common responses advanced and native English speakers to various prompt words.

Prompt word	Group level	Most common response(s)	Total percentage of the three most common answers.[1]
PLAY	Advanced	Children / Tennis (25%)	45.7%
	Native	Game (14.3%)	62.5
CHAIR	Advanced	Desk (37.5%)	75
	Native	Sit (28.6%)	50
BOOK	Advanced	None detected	37.5
	Native	Read (42.9%)	57.1
SURROUND	Advanced	Music (50%)	75
	Native	Sound (57.1%)	71.4
WITH	Advanced	Family (37.5%)	75
	Native	Out (35.7%)	64.3
HE	Advanced	She / My husband (25%)	62.5
	Native	She (28.6%)	50
TEST	Advanced	Difficult (37.5%)	62.5
	Native	None detected	21.4
BEAUTIFUL	Advanced	Me (25%)	50
	Native	Ugly / You / Women (14.3%)	42.9
CAR	Advanced	None detected	37.5
	Native	Kuruma (21.4%)	42.9

1 In cases where less than three groups of common answers were found, a value equal to a single response was
　entered into the calculation.　Thus, for example, when there were no common responses by the advanced
　group to the word BOOK, three responses (out of a total of eight) were selected to give a total of 37.5%.

4), a look at the most common responses (Table 5) reveal some interesting differences.

　　Aitchison (2003) found that native speakers typically gave very similar responses to prompt words.　For example, more than half of all responses to the word HAMMER were "nail".　Also, in cases such as GIRL and SHORT, antonym responses such as "boy" and "long" accounted for over seventy-five percent of answers.　And even in cases where no single response dominated, the most common answers (such as "water", "sea", and "blue" for OCEAN) accounted for two thirds of the responses.

　　The results obtained in this study support this idea of typical responses to words, particularly when the prompt word forms part of a pair (such as HE and "she").　However, the percentage of answers shown in Table 4 is lower (for both groups) than the results described by Aitchison.　Furthermore, in this study (see appendix 1−2 for a list of all responses) the majority of responses from each group do not typically fall into the same word class as the prompt word (for example verbs eliciting other verbs), contradicting the

results for native speakers described by Aitchison (2003).

Generally speaking, there was a greater variety of responses (as shown by the lower percentage of answers in the top three responses) recorded in the native group than in the L2 group, possibly because of a greater amount of vocabulary to choose from and greater exposure to written and spoken material to draw upon for syntagmatic responses. Also interesting is that only the native speaker group had a non-English word (*kuruma,* meaning car) in the top category of responses. The native English-speaking respondents surveyed were living in Japan, and so this specific word would be unlikely to be elicited by native English speakers surveyed in other countries. This demonstrates that exposure to another language can affect mental connections with a person's first language and supports other research that finds an inhibition of the L1 in students immersed in an L2 speaking country (Linck, Kroll, & Sunderman, 2009).

It is interesting to see that only HE elicits the same top result across both groups, likely because "she" is an antonym. Furthermore, the fact that, apart from HE, only CHAIR and TEST elicited identical responses from both L2 groups shows that there can be large differences in vocabulary choices between native and non-native speakers. This supports Meara's findings (1982, cited in Carter, 1987, p. 159) that word associations of L2 learners vary systematically from those of native speakers. Meara (1982) also found that L2 responses were more varied than those of native speakers and theorized that this is due to L2 learners making more clang responses due to misunderstanding the stimulus word.

Of particular interest are the responses to the word SURROUND. This word prompted the highest percentage of top responses from both the native and advanced groups. None of the eight advanced respondents chose sound, while only one of the 14 native respondents chose music. The high percentage of native speakers who responded with sound is likely due to "Surround sound" being a common syntagmatic pair in English referring to speaker arrangements in theaters and home stereos. However, when questioned about their choice of the word "music" the advanced group couldn't think of an equivalent syntagmatic grouping in Japan.

Implications for teaching

This test indicates that there are differences in how word-associations are made between native English-speakers and Japanese English learners. It is thus important for

teachers (native and Japanese) entering the classroom to realize that their ways of thinking about language are not necessarily the same as that of their students, and thus explanations and activities that seem perfectly logical to the teacher's mind may not have the same effect in the students'.

It also appears that there is a tendency towards syntagmatic associations in Japanese English learners. This insight can be useful in syllabus design in that an emphasis on teaching collocations can potentially aid students in their ability to recall vocabulary words. Also, as we have seen, the associations made by Japanese learners do not always match those of native speakers, so simply basing the syllabus on samples of English from native-speaking countries may not be as effective as a syllabus based on L2 English communication.

In addition, the unexpected results found in the native speaker group (non-English word associations and a high percentage of syntagmatic responses) raises some questions. At what point does a "native speaker" cease to represent their original linguistic community?

Considerations for future research

Obviously the relatively small sample sizes in the study make these conclusions vulnerable to bias and outliers. It would be interesting to see if the patterns remain with a larger sample size in future experiments. Furthermore, a test such as this would ideally be conducted individually in a standardized setting, with a minimum of distracting objects, so as to avoid environmental influences on subjects' responses.

In addition, a longitudinal study involving the same participants giving responses to the same stimulus words as they progress during their L2 learning experience is likely the best way to determine in what way (if any) L2 learners become more "native-like" in their mental links involving language, or conversely how English L1 speakers become less so.

Conclusion

Based on this study, the following answers can be given to the three questions posed in McCarthy's task 123 (1990): First, the word-association test (WAT) tells us that Japanese English learners primarily make syntagmatic associations between words. Second, while the responses can be classified into the typical types outlined in McCarthy (1990), the results

do not suggest significant differences in the types of responses given by advanced learners and native speakers.

In performing this study, it became apparent that there is a great deal of subjectivity inherent in the classification of WAT responses. While this problem can be alleviated somewhat through post-test interviews with subjects concerning the rationale behind their responses, it cannot be completely eliminated due to the often subconscious nature of the subjects' responses.

Furthermore, the data obtained in this study appears to contradict the findings of many previous studies (e.g. Aitchison, 2003; Meara, 1982), particularly in regards to the word-associations of the native English-speakers surveyed. This indicates a need for more studies of this type in order to fill in the gaps and further refine our understanding of the mental processes involved in language formation.

Finally, by performing research projects such as this one, teachers can check their assumptions about students' mental processes during word formation. This can be valuable in tailoring lesson plans to student learning styles found in different communities as not every class will learn effectively in the same way. This study found many differences when compared to results of other studies, showing the need for teachers to investigate prior to assuming a "one size fits all" approach to lesson planning.

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Appendix 1. **Results of 8 Japanese advanced level English-speakers to various prompt words.** **Notes and translations appear in brackets following the response.**

	Play	Chair	Book	Surround	With	He	Test	Beautiful	Car
1	golf	big	difficult	music	family	friend	complete	moon	fast
2	tennis	kitchen	my favorite	friends	children	my husband	difficult	Kochi	useful
3	children	wooden	library	music	family	far	night studying	me	red
4	perfect	desk	interesting	music	together	she	difficult	mountain	park
5	game	sit	card (bookmark)	green	friend	boyfriend	study	sunshine	traffic jam
6	tennis	sit	read	truck	my family	my husband	English	flower	convenient
7	children	desk	study	music	friend	she	difficult	diamond	road
8	Blanco (swing)	desk	note	water	you	Matthew	answer	me	wheel

Appendix 2. **Results of 14 native English-speakers to various prompt words.** **Notes and translations appear in brackets following the response.**

	Play	Chair	Book	Surround	With	He	Test	Beautiful	Car
1	park	lift	case	sound	out	man	over	ugly	kuruma (car)
2	blocks	fall	page	music	without	her	marking	ugly	fast
3	pool	sit	read	system	books	drinks	easy	Chocolate	can't drive it
4	dough	table	read	sound	people	is	paper	sunshine	drive
5	theatre	baby	nerd	desert	date	moose	exam	ice	red
6	ping-pong	sex	encyclopedia	forest	girls	she	marks	women	ferrari
7	basketball	issu (chair)	read	me	us	monkey	boring	you	kuruma (car)
8	Playground	desk	library	sound	together	she	shiken (test)	you are beautiful	movie
9	game	sit	shelf	sound	out	man	sound	flower	chase
10	monkey	sit	read	sound	without	she	tesla	rose	kuruma (car)
11	after	issu (chair)	off	sound	out	haw	actor	award	steam
12	ground	high	read	sound	out	heat	study	day	gas
13	game	man	club	saran	out	hito (person)	pregnancy	mango milk	ball
14	soccer	sit	read	sound	together	she	yuck	woman	drive

Appendix 3. **Total number of responses of Advanced (A) and Native (N) groups for individual prompt words by type of word-association (Syntagmatic (Syn), Paradigmatic (Par), Phonological (Pho), and World-knowledge (WK)).**

	Play		Chair		Book		Surround		With		He		Test		Beautiful		Car		
	A	N	A	N	A	N	A	N	A	N	A	N	A	N	A	N	A	N	Total
Syn	6	11	5	8	7	12	2	13	7	10	1	2	6	9	6	10	6	6	127
Par	0	1	3	2	0	1	0	0	1	4	6	7	1	1	0	2	2	1	32
Pho	1	1	0	0	0	0	0	1	0	0	0	2	0	1	0	0	0	0	6
WK	1	1	0	4	1	1	6	0	0	0	1	3	1	3	2	2	0	7	33
Total	8	14	8	14	8	14	8	14	8	14	8	14	8	14	8	14	8	14	198

Appendix 4. **Classification of response types for individual Advanced group responses. (Syntagmatic (Syn), Synonym (Syno), Hyponym (Hyp), Co-Hyponym (CoH), Antonym (Ant), Phonological (Pho), and World-knowledge (WK)). The number of times response is given are included in brackets.**

Play		Chair		Book		Surround		With		He		Test		Beautiful		Car	
golf	Syn	big	Syn	Difficult	Syn	music (4)	WK	family (3)	Syn	friend	Syn	Complete	Syn	moon	Syn	fast	Syn
blanco	WK	desk (3)	CoH	card (bookmark)	WK	friends	Syn	Children	Syn	Boyfriend	Hyp	answer	Syn	diamond	Syn	convenient	Syn
Children (2)	Syn	Kitchen	Syn	Interesting	Syn	green	WK	friend (2)	Syn	far	Syn	difficult (3)	Syn	flower	Syn	red	Syn
game	Syn	sit (2)	Syn	library	Syn	truck	WK	together	Syno	Matthew	WK	English	Syn	kochi	Syn	road	Hyp
Perfect	Pho	Wooden	Syn	my favorite	Syn	water	Syn	you	Syn	my husband (2)	Hyp	night studying	WK	me (2)	WK	traffic jam	Hyp
tennis (2)	Syn			note	Syn					she (2)	Ant	study	Syn	Sunshine	Syn	useful	Syn
				read	Syn									Mountain	Syn	wheel	Syn
				study	Syn											park	Syn

Appendix 5. **Classification of response types for individual Native group responses. (Syntagmatic (Syn), Synonym (Syno), Hyponym (Hyp), Co-Hyponym (CoH), Antonym (Ant), Phonological (Pho), and World-knowledge (WK)). The number of times response is given are included in brackets.**

Play		Chair		Book		Surround		With		He		Test		Beautiful		Car	
park	Syn	lift	Syn	case	Syn	sound (8)	Syn	out (5)	Syn	man (2)	Hyp	over	Syn	Ugly (2)	Ant	kuruma (3)	WK
blocks	Syn	fall	WK	Encyclo-pedia	Hyp	desert	Syn	without (2)	Ant	her	Ant	marking	Syn	Choco-late	WK	fast	Syn
pool	Syn	sit (4)	Syn	library	Syn	forest	Syn	books	Syn	drinks	Syn	easy	Syn	ice	Syn	can't drive it	WK
dough	Syn	table	CoH	nerd	WK	me	Syn	people	Syn	is	Syn	paper	Syn	Sunshine	Syn	drive (2)	Syn
theatre	Hyp	baby	Syn	page	Syn	music	Syn	date	Syn	moose	WK	exam	Syno	women (2)	Syn	red	Syn
pingpong	Syn	sex	WK	read (6)	Syn	system	Syn	girls	Syn	she (4)	Ant	marks	Syn	you	Syn	ferrari	Hyp
basketball	Syn	issu (2)	WK	shelf	Syn	Saran	Pho	us	Syn	monkey	WK	boring	Syn	you are beautiful	Syn	chase	Syn
Playground	Pho	desk	CoH	club	Syn			Together (2)	Syno	heat	Pho	shiken	WK	flower	Syn	movie	WK
ground	Syn	high	Syn	off	Syn					hito	Pho	sound	Syn	rose	Syn	steam	WK
game (2)	Syn	man	Syn							haw	WK	tesla	Pho	award	Syn	gas	Syn
monkey	WK											actor	WK	day	Syn	ball	WK
after	Syn											study	Syn	mango milk	WK		
soccer	Syn											Preg-nancy	Syn				
												yuck	WK				