J. King Saud Univ., Vol. 22, *Lang. & Transl.*, pp. 1-36, Riyadh (2010/1431H.)

Psycholinguistic Determinants of English Vocabulary Retention across Secondary and University Education in Saudi Arabia

Fayza Saleh Al-Hammadi
Department of Foreign Languages, College of Education,
King Faisal University, Al-Ahsa, Saudi Arabia
falhammadi64@yahoo.com

(Received 19/01/1429H.; accepted for publication 04/06/1429H.)

Abstract. The present research project investigates the effect of word length, morphological/orthographic complexity, frequency, and semantic compositionality, in addition to the time interval in the retention of vocabulary items studied in high school. 150 teachers, 800 high school students, and 650 college students participated in a follow-up survey. 139 words differing according to the factors mentioned above were given in a questionnaire form once during their last semester at high school, and another time during the second semester at college, a time difference of roughly one academic year.

Results indicate that there is a remarkable degree of vocabulary attrition in the case of Saudi EFL learners. Formal properties of target vocabulary items constitute a determining factor in vocabulary retention. It was also found that word frequency is a major determinant of vocabulary retention. The results of the present study provide partial support to the Anderson's (1982) "linguistic feature hypotheses". However, it can be assumed that vocabulary attrition results from a number of interrelated factors that include the formal and functional features of the word, in addition to the learning and the teaching strategies adopted in the EFL practices.

1. Introduction

One relatively new area of language research is that which investigates the fate of knowledge of a particular language when that language is not used for significant periods of time. "Language attrition" is the most common term used for any "loss of language skills" (Moorcraft and Gardner, 1987: p. 327) that occurs. The most basic distinction in this field is between losses in the person's native language (L1) and losses in a second, later-learned language (L2). L1 attrition may occur, for instance, in immigrants who adopt the dominant language of their new country, while L2 attrition may occur, for example, in students who learn a second language in school but do not use it once classes have been completed (de Bot and Weltens, 1995). When the learner is not proficient in the second language, the L2 is sometimes referred to as a foreign language (FL), and the subsequent attrition is termed FL attrition. First, this paper will review theories that provide guidelines for predicting the general types of linguistic knowledge most likely to be lost, then discuss the different patterns of loss of vocabulary and grammar in L1 and L2 attrition, and finally review theories regarding which elements of the lexicon in particular may be most resistant to attrition.

It has been established in the literature that vocabulary maintenance is a key factor in foreign language proficiency (see Al-Hammadi, 2004). Vocabulary is the backbone of language proficiency, whether we are dealing with L1 or L2. Language users who have a rich—and organized—mental lexicon coupled with effective retrieval (access) strategies are more likely to exhibit fluent and accurate language performance. They are also likely to be better learners/acquires of language data. At some point in language development, single words are used to convey complete messages. This is also extended to adult language performance.

The importance of vocabulary also arises on the bases of psycholinguistic research findings that point to the mental lexicon as the point of interaction between higher level and lower level language units during on line processing. Specifically, when top-down and bottom-up information interact during language processing, lexicon constitutes a point of intersection carrying indispensable information to

both modes. In addition, lexical items carry all types of linguistic information including formal, grammatical, and semantic details.

On this basis, it can be claimed that loss of vocabulary is more detrimental to language proficiency compared to loss of grammar rules, for instance. This claim is widely supported in the literature of both foreign language and second language acquisition (see Cook, 1991; McCarthy, 1990; Wallace, 1988). One important claim is that a good knowledge of how the system of a language works may not necessarily enable one to communicate, but it is usually possible to communicate if one has the vocabulary (Wallace, 1988). The importance of vocabulary learning has been linked with conversation and written work as Cook (1991) maintains that vocabulary learning provides input for these skills. Nation (1990) argues that vocabulary is the most sizeable and unmanageable component in the learning of any language.

2. Theoretical Background

"Language attrition" is the most common term used for any "loss of language skills" (Moorcraft and Gardner, 1987: p. 327) that occurs. One general theory in attrition research is the regression hypothesis, which suggests that "attrition is the mirror image of acquisition". The first items lost will be the ones that were acquired last (Yoshitomi, 1992: p. 295). This general idea has also been expressed simply as "Last Learned, First Forgotten" (Yoshitomi, 1992: p. 295).

In discussing L2 attrition, Yoshitomi (1992) noted that the theory seemed to have support from research focusing on broad categories of linguistic knowledge. For instance, one is able to comprehend language of a certain level before being able to produce language at that level, and productive skills tend to be more susceptible to attrition than receptive skills (Yoshitomi, 1992; Hansen and Reetz-Kurashige, 1999). Yoshitomi also noted that vocabulary tends to be more resistant to attrition than grammar. Yoshitomi also explained that some studies have found the hypothesis to be true for the acquisition and loss of various grammatical forms, but that it was not possible to generalize from the results of these experiments, because only a few specific structures had been studied.

Anderson's (1982) "linguistic feature hypotheses" provide another way of looking at the attrition puzzle (cited in Weltens (1989) and de Bot and Weltens (1991)). Weltens (1989) explained that these hypotheses have two major areas. First, they state that the nature of the linguistic elements themselves, such as whether they are high or low frequency, and whether they are marked or unmarked (part of Universal Grammar), will be important in determining if they are lost. Second, these hypotheses propose that the relationship between corresponding structures in the dominant and attriting languages is a factor, explaining, for example, that the amount of contrast between the structures in the two languages will help determine what will be vulnerable to attrition (Weltens, 1989). de Bot and Weltens (1991), discussing L1 attrition, gave an example of this hypothesis, explaining that, "on the lexical level, frequency and degree of similarity between L1 and FL words would be relevant factors" (p. 44). Low frequency words would be more likely to be lost than high frequency ones, and non-cognate FL words, in which there is no similarity between the L1 and FL word, would be more likely to be lost than cognate words (de Bot and Weltens, 1991).

Kost *et al.* (1999) carried out a study comparing the effects of pictorial and textual glosses on incidental vocabulary growth for foreign language learners. Participants were asked to read a passage under one of three glossing conditions: Textual gloss alone, pictorial gloss alone, and text combined with pictures. Performance on both production and recognition tests of 14 words was better for those who were allowed to use a combination of text and picture. The theoretical explanation for such results, the authors argue, is that processing information requires different degrees of cognitive effort. The two different representations allow the plotting of the picture into one mental model and thereby provide a "stronger bond" than the plotting of the words (p. 94). Little research exists on the efficacy of video in the domain of L2 vocabulary acquisition. Neuman and Koskinen (1992) state that captioned video with sound provides a semantically enriched context where the visual and the audio lend meaning to the printed words on the screen. Their study compares learning vocabulary through watching television, through reading and listening to a document, and through listening alone. Their results indicated that words were learned and retained best from watching television.

2.1. Acquisition, retention and attrition

The interference theory states that people forget a particular thing "A", because they learned "B" either before (retroactive interference) or after (proactive interference) they learned "A". The memory of "B" interferes with the recall of "A" (Weltens, 1989).

There is a slightly different view of the forgetting process in the "retrieval failure theory", which states that "forgotten information is not gone, but has become inaccessible", and could be obtained with the right cues (Hansen and Reetz-Kurashige, 1999: p. 10). This theory is supported by studies that show that with greater processing time, subjects are able to remember more (Hansen and Reetz-Kurashige, 1999), and by the existence of the "savings" effect, where learning forgotten items is more successful than learning similar items for the first time (de Bot and Stoessel, 2000). The inaccessible information may be what facilitates the improvement seen in relearning.

de Groot and Keijzer (2000) had another hypothesis regarding forgetting. They proposed that "what is hard to learn is easy to forget" (p. 1). Applying this to lexical learning and forgetting, they found that words that seemed easier to learn, such as cognates and concrete words, were better retained in memory. A related theory is the "best learned last forgotten" theory (Weltens, 1989: p. 7), which predicts that items that are learned and integrated most completely are least likely to be forgotten. This concept is similar to the "inverse relation hypothesis", which states that, in L2 attrition, the higher the proficiency level of the language learner, the smaller the amount of subsequent attrition (Yoshitomi, 1992: p. 296; Hansen and Reetz-Kurashige, 1999). As Yoshitomi (1992) noted, this hypothesis is supported by studies such as that of Bahrick (1984a).

Bahrick studied the attrition of school learned Spanish, and, comparing different groups, found that those of very low proficiency (those who had not had any Spanish beyond Level 1, and had obtained only C's on that level) demonstrated so much attrition that their performance on Spanish tasks was not very different from that of a control group who had never taken Spanish. He also found that both obtaining higher grades and completing higher levels of instruction correlated with better performance on Spanish tasks.

3. The Study

3.1. Aim of the study

The aim of the present study is to diagnose the phenomenon of vocabulary attrition in the case of Saudi EFL learners with the view of presenting a set of recommendations for the effective design of course material and teaching methodology. Specifically, it aims to investigate the effect of word length, morphological/orthographic complexity, frequency, and semantic compositionality on the retention of vocabulary items studied in high school.

More specifically, it aims to answer the following questions:

1. What is the relationship between word frequency and word maintenance/attrition?
2. What is the relationship between word formal complexity and word maintenance/attrition?
3. What is the relationship between word semantic complexity and word maintenance/attrition?
4. How can secondary school EFL textbooks be improved to enhance EFL maintenance?
5. How can secondary school EFL methodology be improved to enhance EFL maintenance?

3.2. Methodology

It can be remarked that word frequency and order of acquisition are important factors in the process of retention and attrition. In the context of FL learning, other factors might be considered as well. The present study looks into formal as well as functional determinants of FL vocabulary retention, in addition to cognitive and methodological factors. The formal factors include phonological, morphological, semantic and orthographic complexities. The functional factors include word frequency, and the methodological factors include approaches to vocabulary teaching in the Saudi Arabian context (see Table 1).

Table 1. Formal and functional factors in vocabulary knowledge

FACTORS	ASPECTS
Formal	• Phonological • Morphological • Semantic • orthographic
Functional	• Word frequency
Methodological	• Approaches to vocabulary teaching

In order to investigate the effect of time on vocabulary retention and degree of attrition, a survey of Saudi students' vocabulary knowledge was conducted over a one year period. One survey was conducted during the second term of senior high school and a second survey was conducted during the first semester of the first year college level.

3.3. Procedure

3.3.1. Pilot study

The sample of the pilot study included 100 freshmen from KFU, 50 of them majoring in English

and another 50 were non-English majors. The material of the study consisted of 39 words selected from third grade secondary textbook. Words were classified into 3 categories: A, B and C as illustrated in Table 2 below. This was done to study the effect of individual factors in vocabulary attrition.

Table 2. Formal word categories in the pilot study

Feature/Category	A	B	C
Morphological Complexity	+	-	-
Orthographic Complexity	+	-	-
Frequency	-	-	+
Semantic Relatedness	-	-	+

The word category features were defined as follows (Table 3).

Table 3. Word category features

Category	Definition
Morphological Complexity	More than two morphemes/word
Orthographic Complexity	More than one phoneme-grapheme incompatibility
Frequency	Textbook Frequency
Semantic Relatedness	Rich Semantic Domain

A questionnaire targeting a subjective evaluation of vocabulary knowledge was then administered to the sample. Figure 1 shows the rubric of the questionnaire.

The findings of the pilot study can be summarized in the following points:

- There is a considerable amount of vocabulary attrition between secondary school and university education.
- Formal and semantic complexity affect vocabulary retention.
- Retention of form does not necessarily entail retention of function.
- Attrition in function often precedes attrition in form.
- Time lapse and language proficiency affect vocabulary retention.
- The questionnaire of the main study should include a translation into Arabic for the befit of the less proficient learners.
- Word frequency should not be based solely on textbook occurrence, but it should include teachers' evaluation of students' repertoires.

The findings of the pilot study were taken into consideration and the design and implementation of the main study.

3.3.2. Sample

3.3.2.1. Teachers' sample: Fifty secondary schools were chosen randomly form the Eastern Province in the Kingdom of Saudi Arabia, of which 25 were boys' schools and 25 were girls' schools. Five teachers of English from each school were selected to fill out a questionnaire designed to explore the prevailing strategies of vocabulary teaching, and to ascertain teachers' evaluation of students' vocabulary repertoire. Table 4 shows the teachers' sample profile.

Table 4. Teachers' sample profile

Teachers	No. of Schools	No. of Teachers	Total Questionnaires
Males	25	75	75
Females	25	75	75
G. Total	50	150	150

3.3.2.2. Students' sample: The students sample comprised 20 schools, 10 for boys and 10 for girls. Forty students in each school were randomly selected to participate in the study. Table 5 shows the students' sample profile.

Table 5. Students' sample profile

Students	No. of Schools	No. of Students	Total Questionnaires
Males	10	400	400
Females	10	400	400
G. Total	20	800	800

Do you remember seeing this word before?		How long ago was the last time you met this word? (months)			Did you recognize it fast?		Do you remember the context where it occurred?		Does it remind you of other related words?		Do other related words remind you of this word?		Do you know how to pronounce this word?		Do you know how to spell this word?	
Yes	NO	3	6	12	Yes	No	Yes	No	Yes	NO	Yes	No	Yes	No	Yes	NO

Fig. 1. Students questionnaire rubric.

3.3.3. Tools

The study used the questionnaire technique to collect data. Two questionnaires were designed and employed, one for teachers and another for the students.

3.3.3.1. Teachers' questionnaire: The teachers' questionnaire consisted of two parts; the first part comprised 10 statements targeting the main strategies of teaching vocabulary and the place of vocabulary in classroom instruction. The responses were on a Leekart scale ranging from 'always' to 'never'. The second part had 106 vocabulary items. The teachers were asked to rank the frequency of each word in their students' repertoire. The instructions of this part read as follows:

> Based on your knowledge of the textbooks, classroom interaction, exercises, and examinations, indicate the frequency of the following words in the students' repertoire. Please tick the degree of frequency opposite each word

3.3.3.2. Students' questionnaire: The word frequencies reported in the teachers' questionnaires were tabulated and rank ordered from the most frequent to the least frequent. It should be remarked that the frequency value was calculated by assigning a weight of (4) to the words judged as 'very frequent', (3) to the words judged as 'frequent', (2) to the words judged as 'infrequent', and (1) to words judged as 'very infrequent'. The cumulative weight for each word was then calculated and rank ordered, as stated earlier. The top 30% and the lowest 30% on the rank list were included in the students' questionnaire as 'frequent' and 'infrequent' words respectively.

The students' questionnaire consisted of two parts (see Appendix 2). Part 1 included three sections. Section 1, which included 21 words, targeted students' knowledge of word meaning by asking them to match words with their corresponding meanings in Arabic. Section 2, which included 11 words, targeted students' ability to detect incorrect spelling and correct misspelled words. Section 3, which consisted of 25 words, targeted students' semantic connections established for the target words. Finally, Part 2, which consisted of 84 words investigated students' evaluation of their own vocabulary knowledge (Table 6). Of the 84 words, 60 words were later assigned into six categories representing coalitions of word formal and functional characteristics. The six categories are described in Table 7.

Table 6. Sections of students' questionnaire

Part	Section	No. of Items	Subject
One	1	21	Meaning
	2	11	Spelling
	3	25	Semantic connections
Two	-	82	Vocabulary Knowledge

Table 7. Word pattern

Word Pattern	frequency	Semorph comp	Sprn comp
WP1	+	-	-
WP2	-	+	+
WP3	-	-	-
WP4	-	-	+
WP5	+	+	+
WP6	+	+	-

Semorph comp = semantic and morphological complexity
Sprn comp = spelling and/or pronunciation complexity

As stated earlier, it was considered more reliable, according to the findings of the pilot study to present the rubric of this part in Arabic rather than English. Figure 2 below shows the rubric of part two of the questionnaire.

The questionnaire was given to 5 juries to evaluate and their suggestions were taken into consideration in preparing the final form.

الكلمات	هل تتذكر هذه الكلمة؟		هل تعرفت عليها بسرعة؟		هل تتذكر السياق الذي وردت فيه؟		هل تذكرك بكلمات أخرى مشا ة؟		هل تجد صعوبة في نطقها بشكل صحيح؟		هل تجد صعوبة في كتابتها بشكل صحيح؟	
	نعم	لا	نعم	لا	نعم	لا	نعم	لا	نعم	لا	نعم	لا

Fig. 2. Rubric of part two of students' questionnaire.

3.3.4. Procedure

In the fall semester of the academic year 2005-2006, the teachers' questionnaire distributed and collected. The teachers' responses were tabulated and the frequencies of the vocabulary items were taken into account in preparing the students' questionnaire. When the students questionnaires were put in the pre-final form, they were given to six juries, three of them specialize in experimental psychology, and the other three in applied linguistics. They were requested to judge the content and the format of the questionnaire. Their suggestions were taken into consideration when the questionnaire was put in final form.

The students' questionnaires were then administered to the student sample. 500 copies of the questionnaire were prepared and sent to schools, but 472 copies were returned. Later 72 questionnaires were disregarded for incomplete or irrelevant answers. Thus, the student sample comprised 400 students.

At the beginning of the spring term 2006-2007, a stratified random sample of freshmen college students of different majors at KFU participated in the second phase of the experiment. Every college represented a stratum. Table 8 shows the students in the different strata.

400 questionnaires were randomly selected from the completed questionnaires. As stated earlier, the same questionnaire that was applied in phase one was used here. The responses to the questionnaires in both phases were tabulated and subjected to statistical analysis using SPSS-VERSION 15.

3.4. Data analysis and results

The students' responses in the first and the second phases of the study were tabulated and compared. The differences in the self-reported retention of the selected vocabulary items in the two phases, secondary school and university levels, were taken to reflect the degree of retention vs. attrition as function of time.

Figures 3-8 show the degree of attrition in the six word patterns (refer to Table 7). It is clear from all the charts that there is a remarkable degree of attrition as the degree of retention is less in the second phase. It can also be seen that the initial state of vocabulary knowledge differs according to word pattern. Some words are relatively better maintained at both short term and long term intervals compared to others. Also, the degree of attrition is different in the various word patterns. In other words, word pattern affects the type and degree of attrition.

As shown in Fig. 9, Pattern 1 exhibited the least amount of attrition, followed by Patterns 4 and 6 respectively. On the other hand, Pattern 2 exhibited the most amount of attrition followed by Patterns 3 and 5 respectively. For the composite features of word patterns, refer to Table 7. Table 9 shows the data in Fig. 9.

Tables 10 and 11 summarize the frequencies of positive responses (indicative of vocabulary maintenance) in Phases 1 and 2 respectively. It can be seen from the tables that there is a great deal of variability between the variables in both phases and within each phase as a function of word category. It can also be remarked that word category produces variant effects on the different cognitive processes activated queried in the questionnaire. The degree of attrition can be seen by comparing the sets in Tables 10 and 11.

To ascertain the statistical significance of the differences in the data sets in Phase 1 vs. Phase 2, a t-test was applied to the data. The t-test analysis was conducted on a paired variable basis. Thus, students' self-reported vocabulary knowledge was compared on paired item basis. For instance, word recognition in Phase 1 was compared to word recognition in Phase 2. Table 12 shows the results of this test. As can be seen from the table, all differences are significant at $p = 0.01$.

An analysis of variance was also applied to test the significance of variance among the markers of vocabulary attrition. The test treated the variables in both Phase 1 and Phase 2. Table 13 shows the results of this analysis. Again, the ANOVA test revealed significant differences among word patterns as specified in the study. This shows that word pattern is a significant factor in vocabulary attrition/maintenance. Given the statistically significant differences among all variables, a follow-up test was needed to see the most effective word pattern. Consequently, a Scheffe multiple comparison test was conduced. Table 14 shows the results. Word Categories 1, 3 and 4 were found to be most conducive to vocabulary maintenance.

Table 8. University students sample profile

College	Number of Questionnaires Administered	Number of Questionnaires Returned	Total
College of Education (male and female)	400	350	350
College of Agriculture "Home Economics" (female)	200	150	150
College of Administrative Sciences (male)	200	150	150
Total	800	650	650

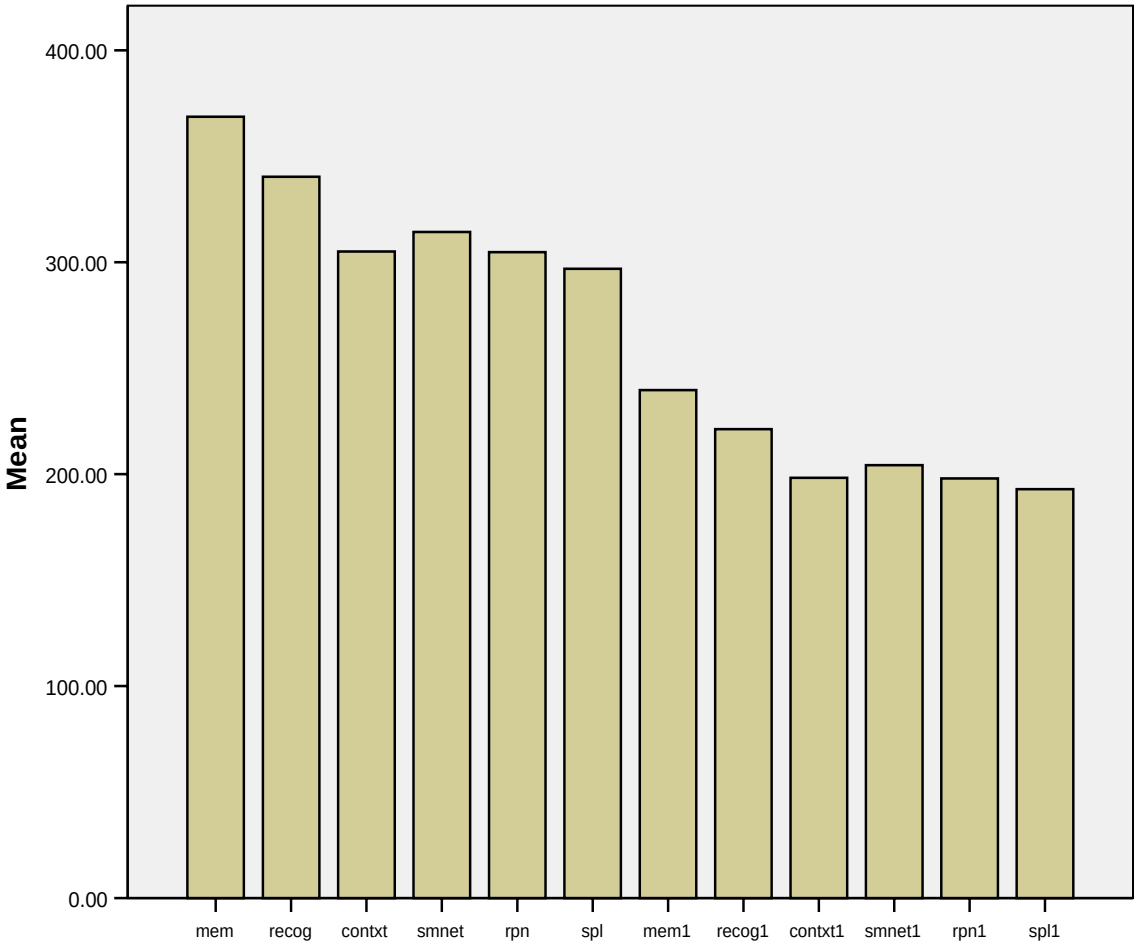

Fig. 3. Retention in Word Category 1.

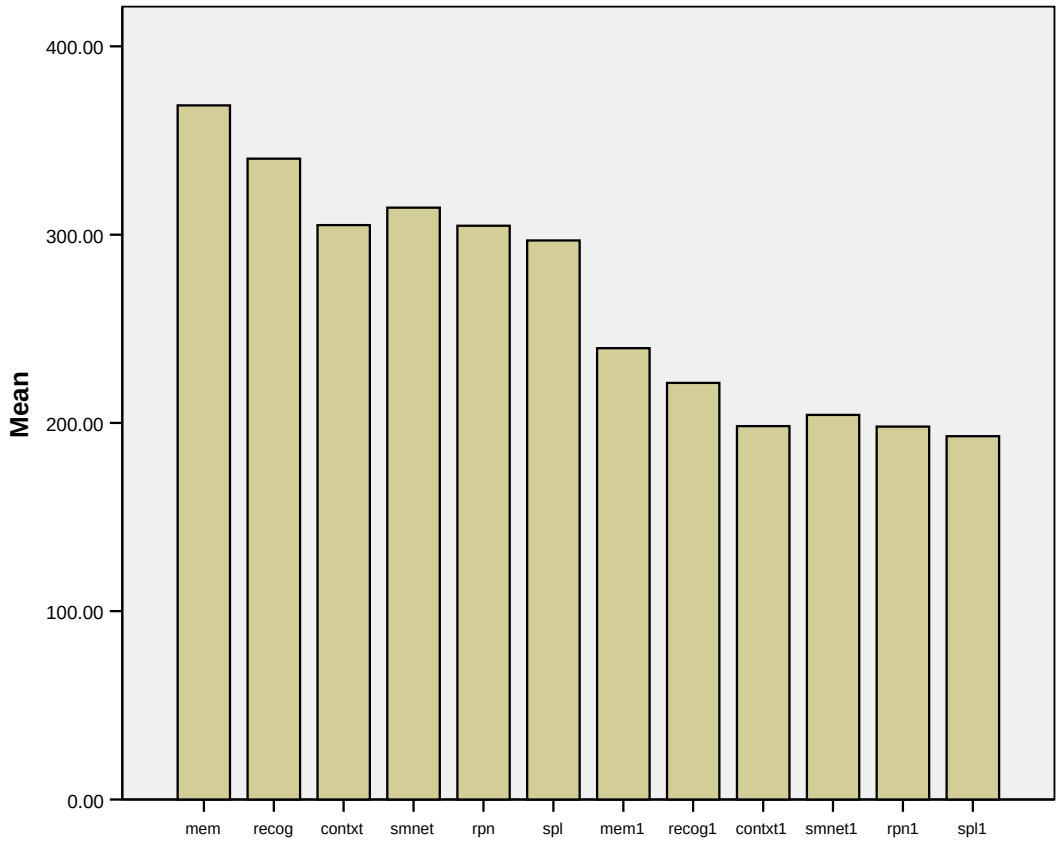

Fig. 4. Retention in Word Category 2.

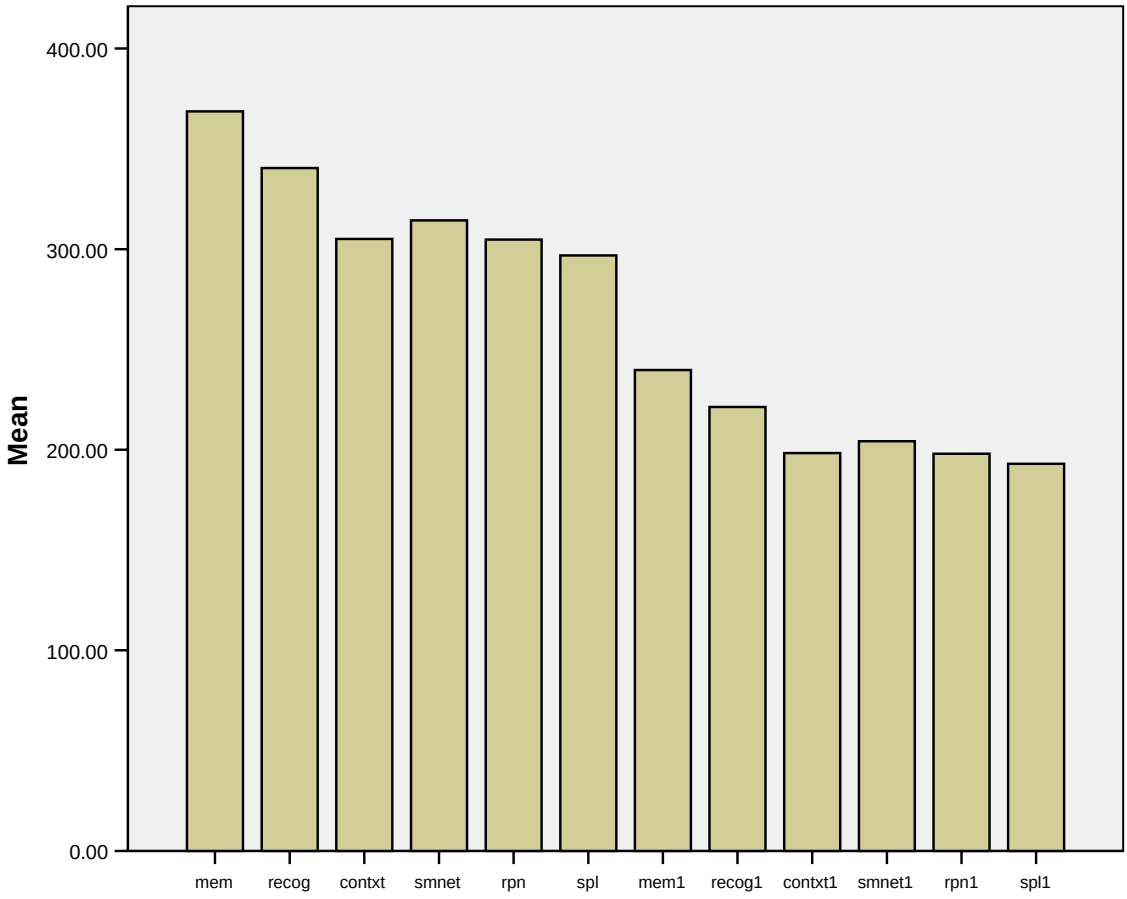

Fig. 5. Retention in Word Category 3.

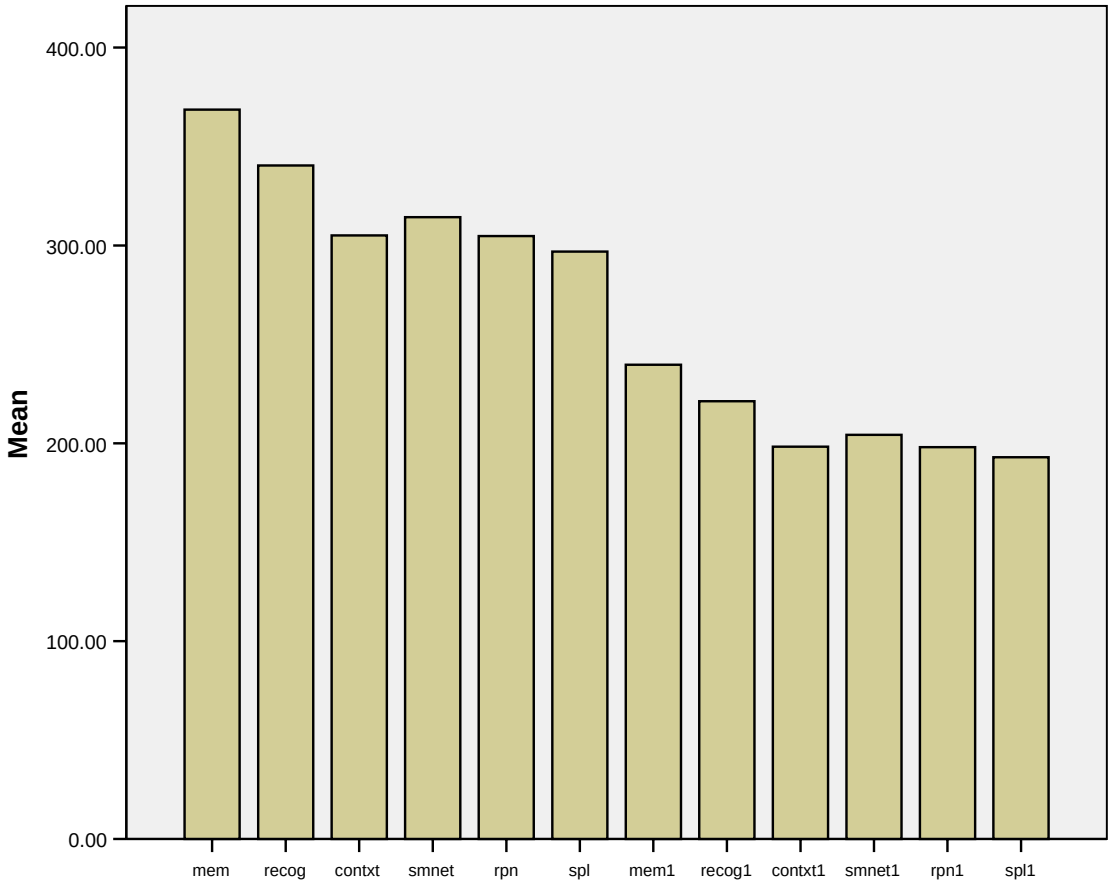

Fig. 6. Retention in Word Category 4.

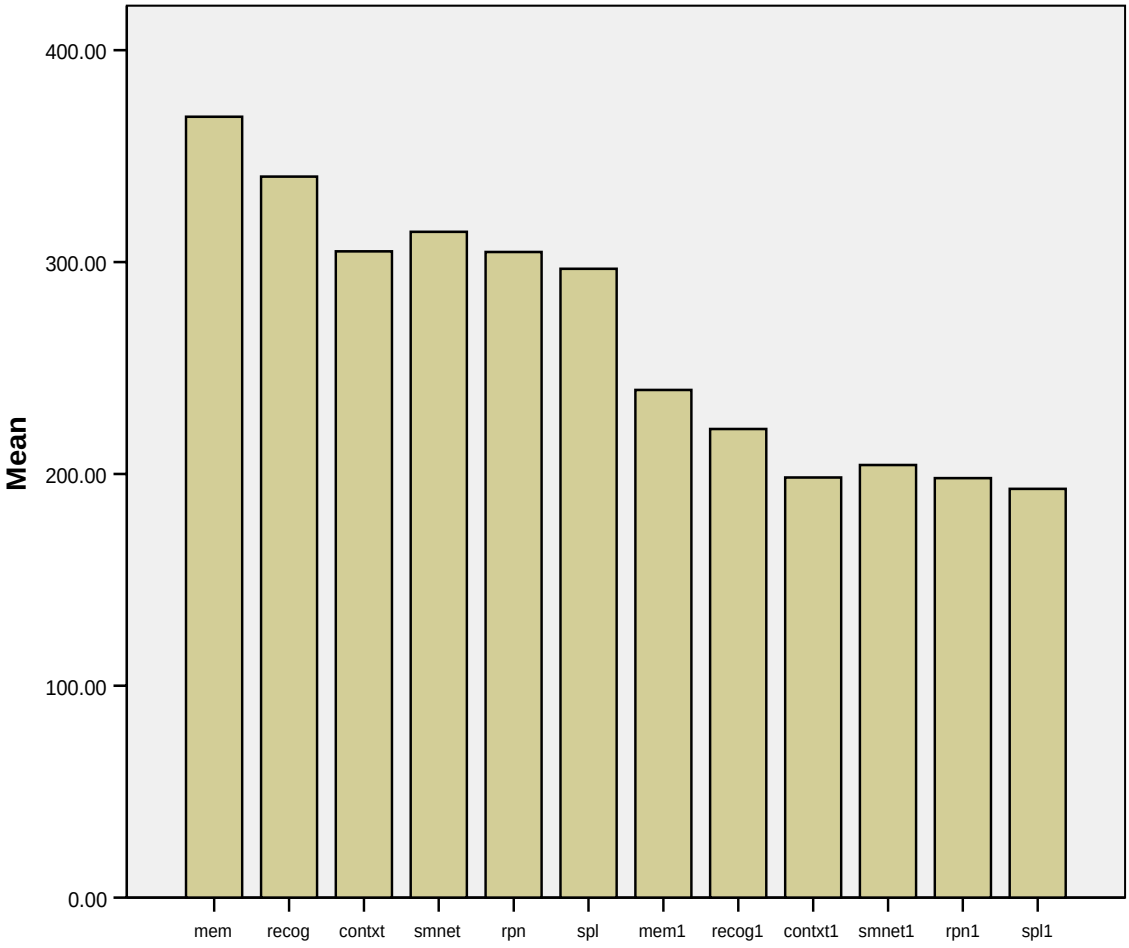

Fig. 7. Retention in Word Category 5.

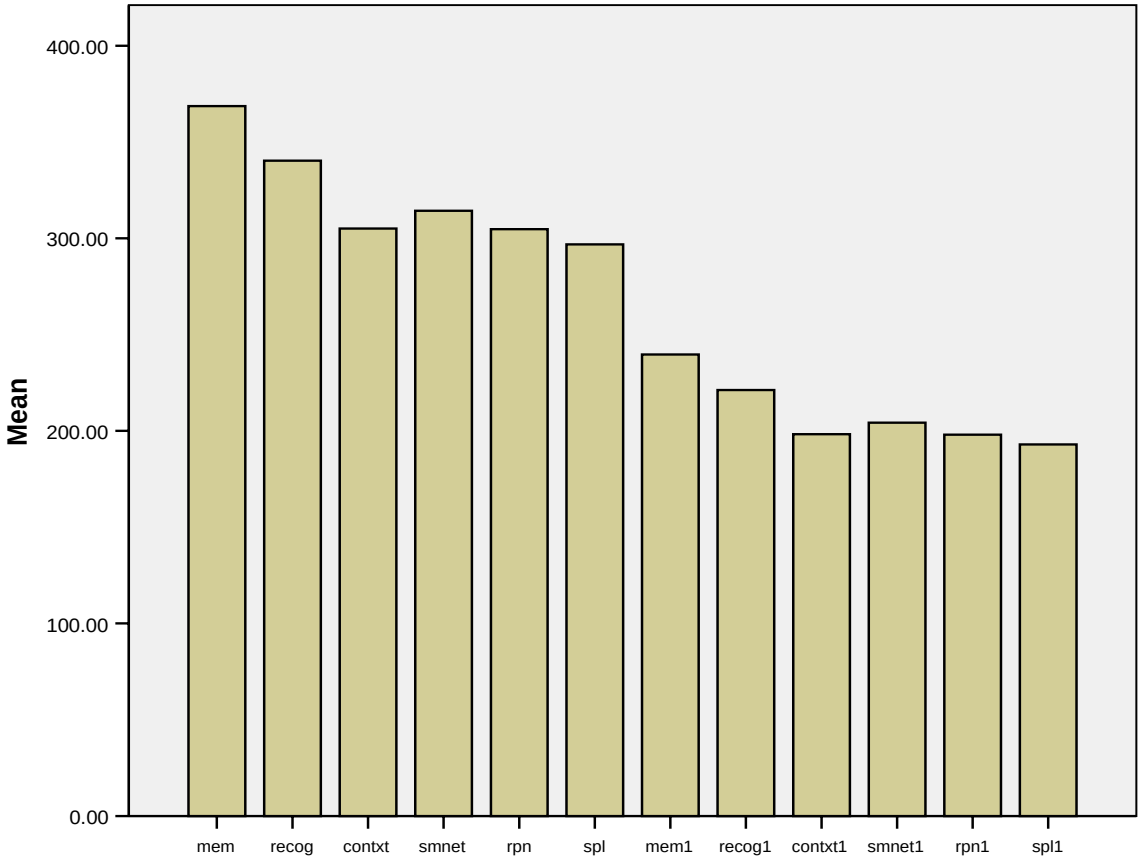

Fig. 8. Retention in Word Category 6.

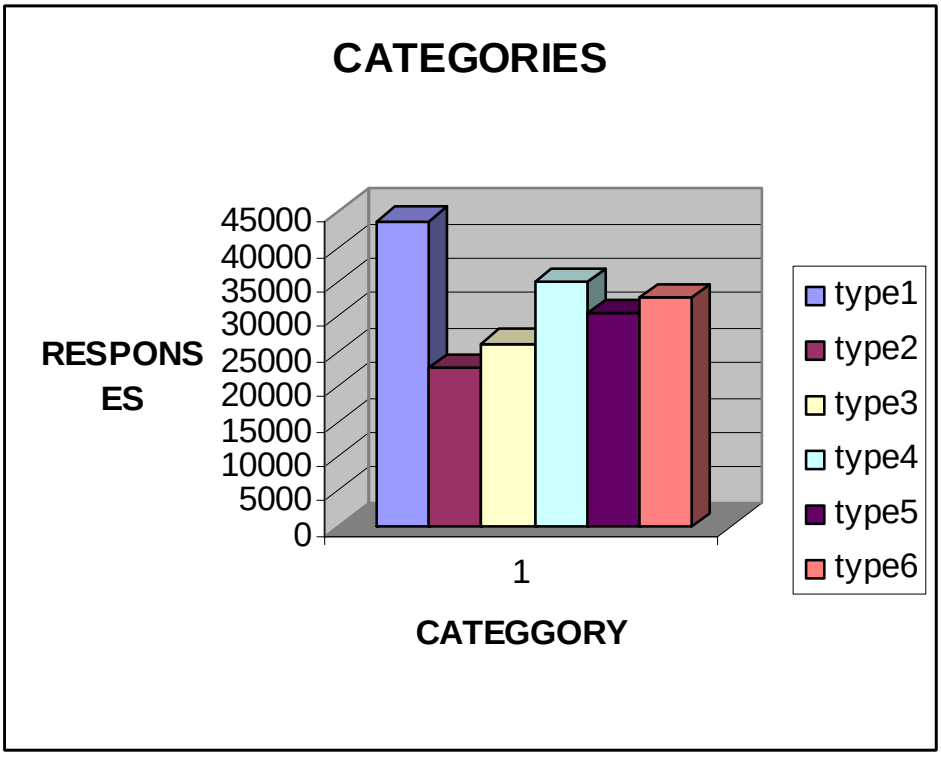

Fig. 9. Vocabulary retention in the six categories.

Table 10. Frequencies of vocabulary maintenance in Phase 1

		N	Mean	Std. Deviation	Minimum	Maximum
mem	type1	10	507.5000	10.40566	498.00	530.00
	type2	10	257.6000	19.91761	229.00	297.00
	type3	10	304.5000	6.25833	299.00	318.00
	type4	10	406.0000	8.35331	398.00	424.00
	type5	10	355.3000	7.27324	349.00	371.00
	type6	10	380.8000	7.84290	374.00	398.00
	Total	60	368.6167	80.36255	229.00	530.00
recog	type1	10	469.3000	22.80862	430.00	502.00
	type2	10	234.8000	11.36075	215.00	251.00
	type3	10	281.7000	13.67114	258.00	301.00
	type4	10	375.6000	18.31332	344.00	402.00
	type5	10	328.5000	15.85525	301.00	351.00
	type6	10	352.3000	17.12081	323.00	377.00
	Total	60	340.3667	76.22335	215.00	502.00
contxt	type1	10	413.6000	8.35597	403.00	429.00
	type2	10	238.0000	.00000	238.00	238.00
	type3	10	248.2000	4.87169	242.00	257.00
	type4	10	330.9000	6.74043	322.00	343.00
	type5	10	289.5000	5.73973	282.00	300.00
	type6	10	310.3000	6.32543	302.00	322.00
	Total	60	305.0833	59.14512	238.00	429.00
smnet	type1	10	433.2000	33.54201	406.00	501.00
	type2	10	217.6000	16.04300	201.00	249.00
	type3	10	260.0000	20.14944	244.00	301.00
	type4	10	346.7000	26.80817	325.00	401.00
	type5	10	303.2000	23.55985	284.00	351.00
	type6	10	325.1000	25.25624	305.00	376.00
	Total	60	314.3000	72.55186	201.00	501.00
rpn	type1	10	418.6000	10.93618	406.00	442.00
	type2	10	216.7000	10.04490	202.00	232.00
	type3	10	251.1000	6.41959	244.00	265.00
	type4	10	335.0000	8.83176	325.00	354.00
	type5	10	292.9000	7.51960	284.00	309.00
	type6	10	314.2000	8.28385	305.00	332.00
	Total	60	304.7500	65.29740	202.00	442.00
spl	type1	10	408.1000	9.57369	390.00	422.00
	type2	10	209.9000	10.31127	195.00	231.00
	type3	10	244.9000	5.70477	234.00	253.00
	type4	10	326.5000	7.74955	312.00	338.00
	type5	10	285.7000	6.68414	273.00	295.00
	type6	10	306.2000	7.13053	293.00	317.00
	Total	60	296.8833	63.87756	195.00	422.00

Table 11. Frequencies of vocabulary maintenance in Phase 2

		N	Mean	Std. Deviation	Minimum	Maximum
mem1	type1	10	329.9000	6.88719	324.00	345.00
	type2	10	167.6000	12.94604	149.00	193.00
	type3	10	198.0000	4.16333	194.00	207.00
	type4	10	264.0000	5.47723	259.00	276.00
	type5	10	231.1000	4.72464	227.00	241.00
	type6	10	247.4000	5.03764	243.00	258.00
	Total	60	239.6667	52.19931	149.00	345.00
recog1	type1	10	305.3000	14.65189	280.00	326.00
	type2	10	152.5000	7.38241	140.00	163.00
	type3	10	183.2000	8.89194	168.00	196.00
	type4	10	244.1000	11.87387	224.00	261.00
	type5	10	213.6000	10.20022	196.00	228.00
	type6	10	228.8000	11.11356	210.00	245.00
	Total	60	221.2500	49.61124	140.00	326.00
contxt1	type1	10	268.8000	5.43241	262.00	279.00
	type2	10	155.0000	.00000	155.00	155.00
	type3	10	161.3000	3.30151	157.00	167.00
	type4	10	215.1000	4.12176	210.00	223.00
	type5	10	188.1000	3.81372	183.00	195.00
	type6	10	201.5000	4.24918	196.00	209.00
	Total	60	198.3000	38.38180	155.00	279.00
smnet1	type1	10	281.6000	22.00606	264.00	326.00
	type2	10	141.4000	10.41580	131.00	162.00
	type3	10	168.9000	12.99957	158.00	195.00
	type4	10	225.2000	17.63708	211.00	261.00
	type5	10	197.1000	15.27125	185.00	228.00
	type6	10	211.2000	16.32176	198.00	244.00
	Total	60	204.2333	47.18567	131.00	326.00
rpn1	type1	10	272.1000	6.96738	264.00	287.00
	type2	10	140.7000	6.61732	131.00	151.00
	type3	10	163.3000	4.19126	158.00	172.00
	type4	10	217.6000	5.66078	211.00	230.00
	type5	10	190.5000	4.85913	185.00	201.00
	type6	10	204.0000	5.29150	198.00	215.00
	Total	60	198.0333	42.44397	131.00	287.00
spl1	type1	10	265.3000	6.09280	254.00	274.00
	type2	10	136.4000	6.60303	127.00	150.00
	type3	10	159.2000	3.88158	152.00	165.00
	type4	10	212.3000	4.80856	203.00	219.00
	type5	10	185.6000	4.47710	177.00	192.00
	type6	10	198.8000	4.77959	190.00	206.00
	Total	60	192.9333	41.53776	127.00	274.00

Table 12. Paired samples test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	mem - mem1	128.95000	28.16623	3.63624	121.67389	136.22611	35.462	59	.000
Pair 2	recog - recog1	119.11667	26.61533	3.43602	112.24120	125.99214	34.667	59	.000
Pair 3	contxt - contxt1	106.78333	20.76755	2.68108	101.41851	112.14816	39.828	59	.000
Pair 4	smnet - smnet1	110.06667	25.36905	3.27513	103.51315	116.62019	33.607	59	.000
Pair 5	rpn - rpn1	106.71667	22.85703	2.95083	100.81207	112.62126	36.165	59	.000
Pair 6	spl - spl1	103.95000	22.34356	2.88454	98.17805	109.72195	36.037	59	.000

Table 13. ANOVA by Word Category (pre+post)

		Sum of Squares	df	Mean Square	F	Sig.
mem	Between Groups	374475.083	5	74895.017	616.975	.000
	Within Groups	6555.100	54	121.391		
	Total	381030.183	59			
recog	Between Groups	327345.133	5	65469.027	228.901	.000
	Within Groups	15444.800	54	286.015		
	Total	342789.933	59			
contxt	Between Groups	204483.083	5	40896.617	1157.755	.000
	Within Groups	1907.500	54	35.324		
	Total	206390.583	59			
smnet	Between Groups	277262.000	5	55452.400	89.921	.000
	Within Groups	33300.600	54	616.678		
	Total	310562.600	59			
rpn	Between Groups	247377.350	5	49475.470	638.561	.000
	Within Groups	4183.900	54	77.480		
	Total	251561.250	59			
spl	Between Groups	237265.283	5	47453.057	737.421	.000
	Within Groups	3474.900	54	64.350		
	Total	240740.183	59			
mem1	Between Groups	157970.733	5	31594.147	611.368	.000
	Within Groups	2790.600	54	51.678		
	Total	160761.333	59			
recog1	Between Groups	138764.150	5	27752.830	232.310	.000
	Within Groups	6451.100	54	119.465		
	Total	145215.250	59			
contxt1	Between Groups	86106.600	5	17221.320	1148.088	.000
	Within Groups	810.000	54	15.000		
	Total	86916.600	59			
smnet1	Between Groups	117210.933	5	23442.187	89.450	.000
	Within Groups	14151.800	54	262.070		
	Total	131362.733	59			

Table 13. *Continued*

rpn1	Between Groups	104545.933	5	20909.187	648.161	.000
	Within Groups	1742.000	54	32.259		
	Total	106287.933	59			
spl1	Between Groups	100341.533	5	20068.307	744.189	.000
	Within Groups	1456.200	54	26.967		
	Total	101797.733	59			

Table 14. Multiple comparisons

Scheffe

Dependent Variable	(I) wrdn	(J) wrdn	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
mem	type1	type2	249.90000(*)	4.92729	.000	232.8810	266.9190
		type3	203.00000(*)	4.92729	.000	185.9810	220.0190
		type4	101.50000(*)	4.92729	.000	84.4810	118.5190
		type5	152.20000(*)	4.92729	.000	135.1810	169.2190
		type6	126.70000(*)	4.92729	.000	109.6810	143.7190
	type2	type1	-249.90000(*)	4.92729	.000	-266.9190	-232.8810
		type3	-46.90000(*)	4.92729	.000	-63.9190	-29.8810
		type4	-148.40000(*)	4.92729	.000	-165.4190	-131.3810
		type5	-97.70000(*)	4.92729	.000	-114.7190	-80.6810
		type6	-123.20000(*)	4.92729	.000	-140.2190	-106.1810
	type3	type1	-203.00000(*)	4.92729	.000	-220.0190	-185.9810
		type2	46.90000(*)	4.92729	.000	29.8810	63.9190
		type4	-101.50000(*)	4.92729	.000	-118.5190	-84.4810
		type5	-50.80000(*)	4.92729	.000	-67.8190	-33.7810
		type6	-76.30000(*)	4.92729	.000	-93.3190	-59.2810
	type4	type1	-101.50000(*)	4.92729	.000	-118.5190	-84.4810
		type2	148.40000(*)	4.92729	.000	131.3810	165.4190
		type3	101.50000(*)	4.92729	.000	84.4810	118.5190
		type5	50.70000(*)	4.92729	.000	33.6810	67.7190
		type6	25.20000(*)	4.92729	.001	8.1810	42.2190
	type5	type1	-152.20000(*)	4.92729	.000	-169.2190	-135.1810
		type2	97.70000(*)	4.92729	.000	80.6810	114.7190
		type3	50.80000(*)	4.92729	.000	33.7810	67.8190
		type4	-50.70000(*)	4.92729	.000	-67.7190	-33.6810
		type6	-25.50000(*)	4.92729	.000	-42.5190	-8.4810
	type6	type1	-126.70000(*)	4.92729	.000	-143.7190	-109.6810
		type2	123.20000(*)	4.92729	.000	106.1810	140.2190
		type3	76.30000(*)	4.92729	.000	59.2810	93.3190
		type4	-25.20000(*)	4.92729	.001	-42.2190	-8.1810
		type5	25.50000(*)	4.92729	.000	8.4810	42.5190
recog	type1	type2	234.50000(*)	7.56326	.000	208.3762	260.6238
		type3	187.60000(*)	7.56326	.000	161.4762	213.7238
		type4	93.70000(*)	7.56326	.000	67.5762	119.8238
		type5	140.80000(*)	7.56326	.000	114.6762	166.9238

Table 14. *Continued*

		type6	117.00000(*)	7.56326	.000	90.8762	143.1238
	type2	type1	-234.50000(*)	7.56326	.000	-260.6238	-208.3762
		type3	-46.90000(*)	7.56326	.000	-73.0238	-20.7762
		type4	-140.80000(*)	7.56326	.000	-166.9238	-114.6762
		type5	-93.70000(*)	7.56326	.000	-119.8238	-67.5762
		type6	-117.50000(*)	7.56326	.000	-143.6238	-91.3762
	type3	type1	-187.60000(*)	7.56326	.000	-213.7238	-161.4762
		type2	46.90000(*)	7.56326	.000	20.7762	73.0238
		type4	-93.90000(*)	7.56326	.000	-120.0238	-67.7762
		type5	-46.80000(*)	7.56326	.000	-72.9238	-20.6762
		type6	-70.60000(*)	7.56326	.000	-96.7238	-44.4762
	type4	type1	-93.70000(*)	7.56326	.000	-119.8238	-67.5762
		type2	140.80000(*)	7.56326	.000	114.6762	166.9238
		type3	93.90000(*)	7.56326	.000	67.7762	120.0238
		type5	47.10000(*)	7.56326	.000	20.9762	73.2238
		type6	23.30000	7.56326	.110	-2.8238	49.4238
	type5	type1	-140.80000(*)	7.56326	.000	-166.9238	-114.6762
		type2	93.70000(*)	7.56326	.000	67.5762	119.8238
		type3	46.80000(*)	7.56326	.000	20.6762	72.9238
		type4	-47.10000(*)	7.56326	.000	-73.2238	-20.9762
		type6	-23.80000	7.56326	.096	-49.9238	2.3238
	type6	type1	-117.00000(*)	7.56326	.000	-143.1238	-90.8762
		type2	117.50000(*)	7.56326	.000	91.3762	143.6238
		type3	70.60000(*)	7.56326	.000	44.4762	96.7238
		type4	-23.30000	7.56326	.110	-49.4238	2.8238
		type5	23.80000	7.56326	.096	-2.3238	49.9238
contxt	type1	type2	175.60000(*)	2.65797	.000	166.4193	184.7807
		type3	165.40000(*)	2.65797	.000	156.2193	174.5807
		type4	82.70000(*)	2.65797	.000	73.5193	91.8807
		type5	124.10000(*)	2.65797	.000	114.9193	133.2807
		type6	103.30000(*)	2.65797	.000	94.1193	112.4807
	type2	type1	-175.60000(*)	2.65797	.000	-184.7807	-166.4193
		type3	-10.20000(*)	2.65797	.020	-19.3807	-1.0193
		type4	-92.90000(*)	2.65797	.000	-102.0807	-83.7193
		type5	-51.50000(*)	2.65797	.000	-60.6807	-42.3193
		type6	-72.30000(*)	2.65797	.000	-81.4807	-63.1193
	type3	type1	-165.40000(*)	2.65797	.000	-174.5807	-156.2193
		type2	10.20000(*)	2.65797	.020	1.0193	19.3807
		type4	-82.70000(*)	2.65797	.000	-91.8807	-73.5193
		type5	-41.30000(*)	2.65797	.000	-50.4807	-32.1193
		type6	-62.10000(*)	2.65797	.000	-71.2807	-52.9193
	type4	type1	-82.70000(*)	2.65797	.000	-91.8807	-73.5193
		type2	92.90000(*)	2.65797	.000	83.7193	102.0807
		type3	82.70000(*)	2.65797	.000	73.5193	91.8807
		type5	41.40000(*)	2.65797	.000	32.2193	50.5807
		type6	20.60000(*)	2.65797	.000	11.4193	29.7807

Table 14. *Continued*

	type5	type1	-124.10000(*)	2.65797	.000	-133.2807	-114.9193
		type2	51.50000(*)	2.65797	.000	42.3193	60.6807
		type3	41.30000(*)	2.65797	.000	32.1193	50.4807
		type4	-41.40000(*)	2.65797	.000	-50.5807	-32.2193
		type6	-20.80000(*)	2.65797	.000	-29.9807	-11.6193
	type6	type1	-103.30000(*)	2.65797	.000	-112.4807	-94.1193
		type2	72.30000(*)	2.65797	.000	63.1193	81.4807
		type3	62.10000(*)	2.65797	.000	52.9193	71.2807
		type4	-20.60000(*)	2.65797	.000	-29.7807	-11.4193
		type5	20.80000(*)	2.65797	.000	11.6193	29.9807
smnet	type1	type2	215.60000(*)	11.10565	.000	177.2407	253.9593
		type3	173.20000(*)	11.10565	.000	134.8407	211.5593
		type4	86.50000(*)	11.10565	.000	48.1407	124.8593
		type5	130.00000(*)	11.10565	.000	91.6407	168.3593
		type6	108.10000(*)	11.10565	.000	69.7407	146.4593
	type2	type1	-215.60000(*)	11.10565	.000	-253.9593	-177.2407
		type3	-42.40000(*)	11.10565	.021	-80.7593	-4.0407
		type4	-129.10000(*)	11.10565	.000	-167.4593	-90.7407
		type5	-85.60000(*)	11.10565	.000	-123.9593	-47.2407
		type6	-107.50000(*)	11.10565	.000	-145.8593	-69.1407
	type3	type1	-173.20000(*)	11.10565	.000	-211.5593	-134.8407
		type2	42.40000(*)	11.10565	.021	4.0407	80.7593
		type4	-86.70000(*)	11.10565	.000	-125.0593	-48.3407
		type5	-43.20000(*)	11.10565	.018	-81.5593	-4.8407
		type6	-65.10000(*)	11.10565	.000	-103.4593	-26.7407
	type4	type1	-86.50000(*)	11.10565	.000	-124.8593	-48.1407
		type2	129.10000(*)	11.10565	.000	90.7407	167.4593
		type3	86.70000(*)	11.10565	.000	48.3407	125.0593
		type5	43.50000(*)	11.10565	.016	5.1407	81.8593
		type6	21.60000	11.10565	.585	-16.7593	59.9593
	type5	type1	-130.00000(*)	11.10565	.000	-168.3593	-91.6407
		type2	85.60000(*)	11.10565	.000	47.2407	123.9593
		type3	43.20000(*)	11.10565	.018	4.8407	81.5593
		type4	-43.50000(*)	11.10565	.016	-81.8593	-5.1407
		type6	-21.90000	11.10565	.570	-60.2593	16.4593
	type6	type1	-108.10000(*)	11.10565	.000	-146.4593	-69.7407
		type2	107.50000(*)	11.10565	.000	69.1407	145.8593
		type3	65.10000(*)	11.10565	.000	26.7407	103.4593
		type4	-21.60000	11.10565	.585	-59.9593	16.7593
		type5	21.90000	11.10565	.570	-16.4593	60.2593
rpn	type1	type2	201.90000(*)	3.93649	.000	188.3032	215.4968
		type3	167.50000(*)	3.93649	.000	153.9032	181.0968
		type4	83.60000(*)	3.93649	.000	70.0032	97.1968
		type5	125.70000(*)	3.93649	.000	112.1032	139.2968
		type6	104.40000(*)	3.93649	.000	90.8032	117.9968

Table 14. *Continued*

	type2	type1	-201.90000(*)	3.93649	.000	-215.4968	-188.3032
		type3	-34.40000(*)	3.93649	.000	-47.9968	-20.8032
		type4	-118.30000(*)	3.93649	.000	-131.8968	-104.7032
		type5	-76.20000(*)	3.93649	.000	-89.7968	-62.6032
		type6	-97.50000(*)	3.93649	.000	-111.0968	-83.9032
	type3	type1	-167.50000(*)	3.93649	.000	-181.0968	-153.9032
		type2	34.40000(*)	3.93649	.000	20.8032	47.9968
		type4	-83.90000(*)	3.93649	.000	-97.4968	-70.3032
		type5	-41.80000(*)	3.93649	.000	-55.3968	-28.2032
		type6	-63.10000(*)	3.93649	.000	-76.6968	-49.5032
	type4	type1	-83.60000(*)	3.93649	.000	-97.1968	-70.0032
		type2	118.30000(*)	3.93649	.000	104.7032	131.8968
		type3	83.90000(*)	3.93649	.000	70.3032	97.4968
		type5	42.10000(*)	3.93649	.000	28.5032	55.6968
		type6	20.80000(*)	3.93649	.000	7.2032	34.3968
	type5	type1	-125.70000(*)	3.93649	.000	-139.2968	-112.1032
		type2	76.20000(*)	3.93649	.000	62.6032	89.7968
		type3	41.80000(*)	3.93649	.000	28.2032	55.3968
		type4	-42.10000(*)	3.93649	.000	-55.6968	-28.5032
		type6	-21.30000(*)	3.93649	.000	-34.8968	-7.7032
	type6	type1	-104.40000(*)	3.93649	.000	-117.9968	-90.8032
		type2	97.50000(*)	3.93649	.000	83.9032	111.0968
		type3	63.10000(*)	3.93649	.000	49.5032	76.6968
		type4	-20.80000(*)	3.93649	.000	-34.3968	-7.2032
		type5	21.30000(*)	3.93649	.000	7.7032	34.8968
spl	type1	type2	198.20000(*)	3.58748	.000	185.8087	210.5913
		type3	163.20000(*)	3.58748	.000	150.8087	175.5913
		type4	81.60000(*)	3.58748	.000	69.2087	93.9913
		type5	122.40000(*)	3.58748	.000	110.0087	134.7913
		type6	101.90000(*)	3.58748	.000	89.5087	114.2913
	type2	type1	-198.20000(*)	3.58748	.000	-210.5913	-185.8087
		type3	-35.00000(*)	3.58748	.000	-47.3913	-22.6087
		type4	-116.60000(*)	3.58748	.000	-128.9913	-104.2087
		type5	-75.80000(*)	3.58748	.000	-88.1913	-63.4087
		type6	-96.30000(*)	3.58748	.000	-108.6913	-83.9087
	type3	type1	-163.20000(*)	3.58748	.000	-175.5913	-150.8087
		type2	35.00000(*)	3.58748	.000	22.6087	47.3913
		type4	-81.60000(*)	3.58748	.000	-93.9913	-69.2087
		type5	-40.80000(*)	3.58748	.000	-53.1913	-28.4087
		type6	-61.30000(*)	3.58748	.000	-73.6913	-48.9087
	type4	type1	-81.60000(*)	3.58748	.000	-93.9913	-69.2087
		type2	116.60000(*)	3.58748	.000	104.2087	128.9913
		type3	81.60000(*)	3.58748	.000	69.2087	93.9913
		type5	40.80000(*)	3.58748	.000	28.4087	53.1913
		type6	20.30000(*)	3.58748	.000	7.9087	32.6913

Table 14. *Continued*

	type5	type1	-122.40000(*)	3.58748	.000	-134.7913	-110.0087
		type2	75.80000(*)	3.58748	.000	63.4087	88.1913
		type3	40.80000(*)	3.58748	.000	28.4087	53.1913
		type4	-40.80000(*)	3.58748	.000	-53.1913	-28.4087
		type6	-20.50000(*)	3.58748	.000	-32.8913	-8.1087
	type6	type1	-101.90000(*)	3.58748	.000	-114.2913	-89.5087
		type2	96.30000(*)	3.58748	.000	83.9087	108.6913
		type3	61.30000(*)	3.58748	.000	48.9087	73.6913
		type4	-20.30000(*)	3.58748	.000	-32.6913	-7.9087
		type5	20.50000(*)	3.58748	.000	8.1087	32.8913
mem1	type1	type2	162.30000(*)	3.21490	.000	151.1956	173.4044
		type3	131.90000(*)	3.21490	.000	120.7956	143.0044
		type4	65.90000(*)	3.21490	.000	54.7956	77.0044
		type5	98.80000(*)	3.21490	.000	87.6956	109.9044
		type6	82.50000(*)	3.21490	.000	71.3956	93.6044
	type2	type1	-162.30000(*)	3.21490	.000	-173.4044	-151.1956
		type3	-30.40000(*)	3.21490	.000	-41.5044	-19.2956
		type4	-96.40000(*)	3.21490	.000	-107.5044	-85.2956
		type5	-63.50000(*)	3.21490	.000	-74.6044	-52.3956
		type6	-79.80000(*)	3.21490	.000	-90.9044	-68.6956
	type3	type1	-131.90000(*)	3.21490	.000	-143.0044	-120.7956
		type2	30.40000(*)	3.21490	.000	19.2956	41.5044
		type4	-66.00000(*)	3.21490	.000	-77.1044	-54.8956
		type5	-33.10000(*)	3.21490	.000	-44.2044	-21.9956
		type6	-49.40000(*)	3.21490	.000	-60.5044	-38.2956
	type4	type1	-65.90000(*)	3.21490	.000	-77.0044	-54.7956
		type2	96.40000(*)	3.21490	.000	85.2956	107.5044
		type3	66.00000(*)	3.21490	.000	54.8956	77.1044
		type5	32.90000(*)	3.21490	.000	21.7956	44.0044
		type6	16.60000(*)	3.21490	.000	5.4956	27.7044
	type5	type1	-98.80000(*)	3.21490	.000	-109.9044	-87.6956
		type2	63.50000(*)	3.21490	.000	52.3956	74.6044
		type3	33.10000(*)	3.21490	.000	21.9956	44.2044
		type4	-32.90000(*)	3.21490	.000	-44.0044	-21.7956
		type6	-16.30000(*)	3.21490	.001	-27.4044	-5.1956
	type6	type1	-82.50000(*)	3.21490	.000	-93.6044	-71.3956
		type2	79.80000(*)	3.21490	.000	68.6956	90.9044
		type3	49.40000(*)	3.21490	.000	38.2956	60.5044
		type4	-16.60000(*)	3.21490	.000	-27.7044	-5.4956
		type5	16.30000(*)	3.21490	.001	5.1956	27.4044
recog1	type1	type2	152.80000(*)	4.88804	.000	135.9165	169.6835
		type3	122.10000(*)	4.88804	.000	105.2165	138.9835
		type4	61.20000(*)	4.88804	.000	44.3165	78.0835
		type5	91.70000(*)	4.88804	.000	74.8165	108.5835
		type6	76.50000(*)	4.88804	.000	59.6165	93.3835

Table 14. *Continued*

	type2	type1	-152.80000(*)	4.88804	.000	-169.6835	-135.9165
		type3	-30.70000(*)	4.88804	.000	-47.5835	-13.8165
		type4	-91.60000(*)	4.88804	.000	-108.4835	-74.7165
		type5	-61.10000(*)	4.88804	.000	-77.9835	-44.2165
		type6	-76.30000(*)	4.88804	.000	-93.1835	-59.4165
	type3	type1	-122.10000(*)	4.88804	.000	-138.9835	-105.2165
		type2	30.70000(*)	4.88804	.000	13.8165	47.5835
		type4	-60.90000(*)	4.88804	.000	-77.7835	-44.0165
		type5	-30.40000(*)	4.88804	.000	-47.2835	-13.5165
		type6	-45.60000(*)	4.88804	.000	-62.4835	-28.7165
	type4	type1	-61.20000(*)	4.88804	.000	-78.0835	-44.3165
		type2	91.60000(*)	4.88804	.000	74.7165	108.4835
		type3	60.90000(*)	4.88804	.000	44.0165	77.7835
		type5	30.50000(*)	4.88804	.000	13.6165	47.3835
		type6	15.30000	4.88804	.100	-1.5835	32.1835
	type5	type1	-91.70000(*)	4.88804	.000	-108.5835	-74.8165
		type2	61.10000(*)	4.88804	.000	44.2165	77.9835
		type3	30.40000(*)	4.88804	.000	13.5165	47.2835
		type4	-30.50000(*)	4.88804	.000	-47.3835	-13.6165
		type6	-15.20000	4.88804	.104	-32.0835	1.6835
	type6	type1	-76.50000(*)	4.88804	.000	-93.3835	-59.6165
		type2	76.30000(*)	4.88804	.000	59.4165	93.1835
		type3	45.60000(*)	4.88804	.000	28.7165	62.4835
		type4	-15.30000	4.88804	.100	-32.1835	1.5835
		type5	15.20000	4.88804	.104	-1.6835	32.0835
contxt1	type1	type2	113.80000(*)	1.73205	.000	107.8174	119.7826
		type3	107.50000(*)	1.73205	.000	101.5174	113.4826
		type4	53.70000(*)	1.73205	.000	47.7174	59.6826
		type5	80.70000(*)	1.73205	.000	74.7174	86.6826
		type6	67.30000(*)	1.73205	.000	61.3174	73.2826
	type2	type1	-113.80000(*)	1.73205	.000	-119.7826	-107.8174
		type3	-6.30000(*)	1.73205	.033	-12.2826	-.3174
		type4	-60.10000(*)	1.73205	.000	-66.0826	-54.1174
		type5	-33.10000(*)	1.73205	.000	-39.0826	-27.1174
		type6	-46.50000(*)	1.73205	.000	-52.4826	-40.5174
	type3	type1	-107.50000(*)	1.73205	.000	-113.4826	-101.5174
		type2	6.30000(*)	1.73205	.033	.3174	12.2826
		type4	-53.80000(*)	1.73205	.000	-59.7826	-47.8174
		type5	-26.80000(*)	1.73205	.000	-32.7826	-20.8174
		type6	-40.20000(*)	1.73205	.000	-46.1826	-34.2174
	type4	type1	-53.70000(*)	1.73205	.000	-59.6826	-47.7174
		type2	60.10000(*)	1.73205	.000	54.1174	66.0826
		type3	53.80000(*)	1.73205	.000	47.8174	59.7826
		type5	27.00000(*)	1.73205	.000	21.0174	32.9826
		type6	13.60000(*)	1.73205	.000	7.6174	19.5826
	type5	type1	-80.70000(*)	1.73205	.000	-86.6826	-74.7174

Table 14. *Continued*

		type2	33.10000(*)	1.73205	.000	27.1174	39.0826
		type3	26.80000(*)	1.73205	.000	20.8174	32.7826
		type4	-27.00000(*)	1.73205	.000	-32.9826	-21.0174
		type6	-13.40000(*)	1.73205	.000	-19.3826	-7.4174
	type6	type1	-67.30000(*)	1.73205	.000	-73.2826	-61.3174
		type2	46.50000(*)	1.73205	.000	40.5174	52.4826
		type3	40.20000(*)	1.73205	.000	34.2174	46.1826
		type4	-13.60000(*)	1.73205	.000	-19.5826	-7.6174
		type5	13.40000(*)	1.73205	.000	7.4174	19.3826
smnet1	type1	type2	140.20000(*)	7.23976	.000	115.1936	165.2064
		type3	112.70000(*)	7.23976	.000	87.6936	137.7064
		type4	56.40000(*)	7.23976	.000	31.3936	81.4064
		type5	84.50000(*)	7.23976	.000	59.4936	109.5064
		type6	70.40000(*)	7.23976	.000	45.3936	95.4064
	type2	type1	-140.20000(*)	7.23976	.000	-165.2064	-115.1936
		type3	-27.50000(*)	7.23976	.022	-52.5064	-2.4936
		type4	-83.80000(*)	7.23976	.000	-108.8064	-58.7936
		type5	-55.70000(*)	7.23976	.000	-80.7064	-30.6936
		type6	-69.80000(*)	7.23976	.000	-94.8064	-44.7936
	type3	type1	-112.70000(*)	7.23976	.000	-137.7064	-87.6936
		type2	27.50000(*)	7.23976	.022	2.4936	52.5064
		type4	-56.30000(*)	7.23976	.000	-81.3064	-31.2936
		type5	-28.20000(*)	7.23976	.017	-53.2064	-3.1936
		type6	-42.30000(*)	7.23976	.000	-67.3064	-17.2936
	type4	type1	-56.40000(*)	7.23976	.000	-81.4064	-31.3936
		type2	83.80000(*)	7.23976	.000	58.7936	108.8064
		type3	56.30000(*)	7.23976	.000	31.2936	81.3064
		type5	28.10000(*)	7.23976	.018	3.0936	53.1064
		type6	14.00000	7.23976	.591	-11.0064	39.0064
	type5	type1	-84.50000(*)	7.23976	.000	-109.5064	-59.4936
		type2	55.70000(*)	7.23976	.000	30.6936	80.7064
		type3	28.20000(*)	7.23976	.017	3.1936	53.2064
		type4	-28.10000(*)	7.23976	.018	-53.1064	-3.0936
		type6	-14.10000	7.23976	.584	-39.1064	10.9064
	type6	type1	-70.40000(*)	7.23976	.000	-95.4064	-45.3936
		type2	69.80000(*)	7.23976	.000	44.7936	94.8064
		type3	42.30000(*)	7.23976	.000	17.2936	67.3064
		type4	-14.00000	7.23976	.591	-39.0064	11.0064
		type5	14.10000	7.23976	.584	-10.9064	39.1064
rpn1	type1	type2	131.40000(*)	2.54005	.000	122.6266	140.1734
		type3	108.80000(*)	2.54005	.000	100.0266	117.5734
		type4	54.50000(*)	2.54005	.000	45.7266	63.2734
		type5	81.60000(*)	2.54005	.000	72.8266	90.3734
		type6	68.10000(*)	2.54005	.000	59.3266	76.8734
	type2	type1	-131.40000(*)	2.54005	.000	-140.1734	-122.6266

Table 14. *Continued*

		type3	-22.60000(*)	2.54005	.000	-31.3734	-13.8266
		type4	-76.90000(*)	2.54005	.000	-85.6734	-68.1266
		type5	-49.80000(*)	2.54005	.000	-58.5734	-41.0266
		type6	-63.30000(*)	2.54005	.000	-72.0734	-54.5266
	type3	type1	-108.80000(*)	2.54005	.000	-117.5734	-100.0266
		type2	22.60000(*)	2.54005	.000	13.8266	31.3734
		type4	-54.30000(*)	2.54005	.000	-63.0734	-45.5266
		type5	-27.20000(*)	2.54005	.000	-35.9734	-18.4266
		type6	-40.70000(*)	2.54005	.000	-49.4734	-31.9266
	type4	type1	-54.50000(*)	2.54005	.000	-63.2734	-45.7266
		type2	76.90000(*)	2.54005	.000	68.1266	85.6734
		type3	54.30000(*)	2.54005	.000	45.5266	63.0734
		type5	27.10000(*)	2.54005	.000	18.3266	35.8734
		type6	13.60000(*)	2.54005	.000	4.8266	22.3734
	type5	type1	-81.60000(*)	2.54005	.000	-90.3734	-72.8266
		type2	49.80000(*)	2.54005	.000	41.0266	58.5734
		type3	27.20000(*)	2.54005	.000	18.4266	35.9734
		type4	-27.10000(*)	2.54005	.000	-35.8734	-18.3266
		type6	-13.50000(*)	2.54005	.000	-22.2734	-4.7266
	type6	type1	-68.10000(*)	2.54005	.000	-76.8734	-59.3266
		type2	63.30000(*)	2.54005	.000	54.5266	72.0734
		type3	40.70000(*)	2.54005	.000	31.9266	49.4734
		type4	-13.60000(*)	2.54005	.000	-22.3734	-4.8266
		type5	13.50000(*)	2.54005	.000	4.7266	22.2734
spl1	type1	type2	128.90000(*)	2.32236	.000	120.8785	136.9215
		type3	106.10000(*)	2.32236	.000	98.0785	114.1215
		type4	53.00000(*)	2.32236	.000	44.9785	61.0215
		type5	79.70000(*)	2.32236	.000	71.6785	87.7215
		type6	66.50000(*)	2.32236	.000	58.4785	74.5215
	type2	type1	-128.90000(*)	2.32236	.000	-136.9215	-120.8785
		type3	-22.80000(*)	2.32236	.000	-30.8215	-14.7785
		type4	-75.90000(*)	2.32236	.000	-83.9215	-67.8785
		type5	-49.20000(*)	2.32236	.000	-57.2215	-41.1785
		type6	-62.40000(*)	2.32236	.000	-70.4215	-54.3785
	type3	type1	-106.10000(*)	2.32236	.000	-114.1215	-98.0785
		type2	22.80000(*)	2.32236	.000	14.7785	30.8215
		type4	-53.10000(*)	2.32236	.000	-61.1215	-45.0785
		type5	-26.40000(*)	2.32236	.000	-34.4215	-18.3785
		type6	-39.60000(*)	2.32236	.000	-47.6215	-31.5785
	type4	type1	-53.00000(*)	2.32236	.000	-61.0215	-44.9785
		type2	75.90000(*)	2.32236	.000	67.8785	83.9215
		type3	53.10000(*)	2.32236	.000	45.0785	61.1215
		type5	26.70000(*)	2.32236	.000	18.6785	34.7215
		type6	13.50000(*)	2.32236	.000	5.4785	21.5215
	type5	type1	-79.70000(*)	2.32236	.000	-87.7215	-71.6785

Table 14. *Continued*

	type2	49.20000(*)	2.32236	.000	41.1785	57.2215
	type3	26.40000(*)	2.32236	.000	18.3785	34.4215
	type4	-26.70000(*)	2.32236	.000	-34.7215	-18.6785
	type6	-13.20000(*)	2.32236	.000	-21.2215	-5.1785
type6	type1	-66.50000(*)	2.32236	.000	-74.5215	-58.4785
	type2	62.40000(*)	2.32236	.000	54.3785	70.4215
	type3	39.60000(*)	2.32236	.000	31.5785	47.6215
	type4	-13.50000(*)	2.32236	.000	-21.5215	-5.4785
	type5	13.20000(*)	2.32236	.000	5.1785	21.2215

3.5. Discussion and conclusion

Saudi EFL learners' knowledge of vocabulary was investigated at two different time intervals with approximately one year difference. It was assumed that the difference in self-reported knowledge of vocabulary items represents attrition when there is some type of loss at formal or functional levels, and maintenance when no such loss is attested. Words were classified into different categories according to their formal complexity with the aim of studying the effect of such feature on vocabulary maintenance. These features included word frequency, as reported by teachers, and morphological, semantic, pronunciation, and spelling complexity as judged by six juries.

Three main issues were addressed in the present study:

1. The degree of vocabulary knowledge as indicated by positive responses to questionnaire items in the two phases of the study. The difference in vocabulary knowledge between Phase 1 and Phase 2 indicates the degree of attrition.
2. The degree of vocabulary knowledge as a function of experimental word categories in both phases of the study. The difference in vocabulary knowledge between Phase 1 and Phase 2 indicates the effect of formal word properties on lexical retention.
3. The type of vocabulary knowledge as a function of experimental word categories and time interval. The differences in vocabulary knowledge are indicative of the cumulative effect of time and formal word properties on lexical retention.

Results indicate that there is a remarkable degree of vocabulary attrition in the case of Saudi EFL learners. Formal properties of target vocabulary items constitute a determining factor in vocabulary retention. Although the study covered a one-year period, the results show significant deterioration in vocabulary knowledge at both the formal and the functional levels. The results also show that the loss of form precedes the loss of function. In other words, pronunciation and spelling are lost prior to knowledge of word class or contextual constraints.

It can also be remarked that word frequency is a major determinant of vocabulary retention. The least amount of attrition was exhibited in Category 1 in which words are frequent, and formally and functionally simple. Formal and functional complexities have no remarkable adverse effects on vocabulary knowledge when the target words are frequent. On the other hand, the most amount of attrition occurred in Pattern 2 where words are infrequent and exhibit formal and functional complexities. Also, spelling and pronunciation is less significant in vocabulary retention compared to other formal and functional features. This can be seen from the comparison of Patterns 4, 5 and 6. In general, time-induced attrition appeared in all formal and functional features of vocabulary.

The results of the present study provide support to the Anderson's (1982) "linguistic feature hypotheses". However, it can be assumed that vocabulary attrition results from a number of interrelated factors that include the formal and functional features of the word, in addition to the learning and the teaching strategies adopted in the EFL practices. As reported in the teachers' questionnaires, no serious attempt is made in the EFL classroom to emphasize the role of macro/micro contextual factors in vocabulary learning. Furthermore, less emphasis is placed on the learners' mastery of formal features such as morphological structure, spelling and pronunciation. These features play a vital role in sharpening lexical memory. Furthermore, neglecting the process of recycling new vocabulary and highlighting formal and semantic connections within the FL lexicon can be conducive to vocabulary attrition. It is only logical to assume that recycling vocabulary minimizes attrition that results from the time factors. It is safe, on the basis of

the present study, that the strategies of vocabulary teaching in Saudi EFL classrooms ought to be reconsidered.

References

Al-Hammadi, F.S. "The Relationship between Saudi EFL Learners' Lexical Strategies of Organizing the Mental Lexicon and the Quality of Listening and Reading Comprehension." *Unpublished PhD Dissertation, Girls College of Education*, Riyadh, Saudi Arabia, (2004).

Altenberg, E.P. "Assessing First Language Vulnerability to Attrition." In: H.W. Seliger and R.M. Vago (Eds.), *First Language Attrition*. Cambridge: Cambridge University Press, (1991), pp. 189-206.

Bahrick, H.P. "Semantic Memory Content in Permastore: Fifty Years of Memory for Spanish Learned in School." *Journal of Experimental Psychology: General*, Vol. 113, No. (1), (1984a), 1-29.

Bahrick, H.P. "Associations and Organization in Cognitive Psychology: A Reply to Neisser." *Journal of Experimental Psychology: General*, Vol. 113, No. (1), (1984b), 36-37.

Craik, F.I.M. and Lockhart, R.S. "Levels of Processing: A Framework for Memory Research." *Journal of Verbal Learning and Verbal Behavior*, Vol. 11, (1972), 671-684.

de Bot, K. and Weltens, B. "Recapitulation, Regression, and Language Loss." In: H.W. Seliger and R.M. Vago (Eds.), *First Language Attrition*. Cambridge: Cambridge University Press, (1991), pp. 31-52.

de Bot, K. and Weltens, B. "Foreign Language Attrition." *Annual Review of Applied Linguistics*, Vol. 15, (1995), 151-164.

de Bot, K. and Stoessel, S. "In Search of Yesterday's Words: Reactivating a Long-forgotten Language." *Applied Linguistics*, Vol. 21, No. (3), (2000), 333-353.

de Groot, A. and Keijzer, R. "What is Hard to Learn is Easy to Forget: The Roles of Word Concreteness, Cognate Status, and Word Frequency in Foreign Language Learning and Forgetting." *Language Learning*, Vol. 50, No. (1), (2000), 1-56.

Ellis, N. and Beaton, A. "Psycholinguistic Determinants of Foreign Language Vocabulary Learning." *Language Learning*, Vol. 43, No. (4), (1993), 559-617.

Gascoigne, C. "Lexical and Conceptual Representations in More and Less Skilled Bilinguals: The Role of Cognates." *Foreign Language Annals*, Vol. 34, No. (5), (2001), 446-452.

Hansen, L. and Reetz-Kurashige, A. "Investigating Second Language Attrition: An Introduction." In: L. Hansen (Ed.), *Second Language Attrition in Japanese Contexts*. Oxford: Oxford University Press, (1999), pp. 3-20.

Helstrom, J. and Schmitt, C.J. *French: Rencontres.* New York: McGraw Hill Book Company, (1985).

Heredia, R. and McLaughlin, B. "Bilingual Memory Revisited." In: R.J. Harris (Ed.), *Cognitive Processing in Bilinguals*. Amsterdam: Elsevier Science Publishing Company, (1992), pp. 91-103.

Lotto, L. and de Groot, A.M.B. "Effects of Learning Method and Word Type on Acquiring Vocabulary in an Unfamiliar Language." *Language Learning*, Vol. 48, No. (1), (1998), 31-69.

Moorcraft, R. and Gardner, R.C. "Linguistic Factors in Second Language Loss." *Language Learning*, Vol. 37, No. (3), (1987), 327-340.

MRC Psycholinguistic Database. Available online at: http://www.psy.uwa.edu.au/mrcdatabase/uwa_mrc.htm.

Neisser, U. "Interpreting Harry Bahrick's Discovery: What Confers Immunity against Forgetting?" *Journal of Experimental Psychology: General*, Vol. 113, No. (1), (1984), 32-35.

Olshtain, E. and Barzilay, M. "Lexical Retrieval Difficulties in Adult Language Attrition." In: H.W. Seliger and R.M. Vago (Eds.), *First Language Attrition*. Cambridge: Cambridge University Press, (1991), pp. 139-150.

Paivio, A. and Desrochers, A. "A Dual-coding Approach to Bilingual Memory." *Canadian Journal of Psychology*, Vol. 34, (1980), 388-399.

Schmitt, C.J. and Helstrom, J. *French: Connaissances*. New York: McGraw-Hill Book Company, (1985).

Schmitt, C.J. and Helstrom, J. *French: Illuminations*. New York: McGraw-Hill Book Company, (1988).

Schmitt, C.J. and Lutz, K.B. *Bienvenue: Glencoe French 1*. New York: Glencoe Macmillan/McGraw-Hill, (1994).

Tomiyama, M. "The First Stage of Second Language Attrition: A Case Study of a Japanese Returnee." In: L. Hansen (Ed.), *Second Language Attrition in Japanese Contexts*. Oxford: Oxford University Press, (1999), pp. 59-79.

Valette, J.P. and Valette, R.M. *Discovering French: Blanc*. Lexington: D.C. Heath, (1994).

Weltens, B. *The Attrition of French as a Foreign Language*. Dordrecht: Foris Publications, (1989).

Yoshitomi, A. "Towards a Model of Language Attrition: Neurobiological and Psychological Contributions." *Issues in Applied Linguistics*, Vol. 3, No. (2), (1992), 293-318.

Yoshitomi, A. "On the Loss of English as a Second Language by Japanese Returnee Children." In: L. Hansen (Ed.), *Second Language Attrition in Japanese Contexts*. Oxford: Oxford University Press, (1999), pp. 80-111.

APPENDIX 1

Factors Affecting Vocabulary Maintenance

(Teachers' Questionnaire)

Dear Teacher,

The researcher is conducting a research project that aims at exploring vocabulary maintenance over a period of time by Saudi EFL learners. To draw a complete picture of vocabulary teaching and learning in the Kingdom, the researcher has designed the following questionnaire that addresses major issues and classroom practices of vocabulary teaching in your school. Please take a few minutes to fill out the questionnaire bearing in mind that there are no correct or wrong answers. The correct answer is, in fact, the one that reflects your point of view.

Thank you very much for your cooperation.

Date

Name (Optional): .....
School: .....
EFL teaching experience: .....years

PART ONE:

Please read the following statements carefully, then tick the answer the represents your viewpoint:

1. Does your teaching approach reflect the importance of vocabulary in successful EFL learning?
   - Always
   - Often
   - Sometimes
   - Rarely
   - Never

2. Do you set a specific time for vocabulary drills in your class period?
   - Always
   - Often
   - Sometimes
   - Rarely
   - Never

3. Do you insist on correct pronunciation?
   - Always
   - Often
   - Sometimes
   - Rarely
   - Never

4. Do you insist on correct spelling?
   - Always
   - Often
   - Sometimes
   - Rarely
   - Never

5. Do you teach vocabulary in context (as opposed to isolated words)?
   - Always
   - Often
   - Sometimes
   - Rarely
   - Never

6. Do you encourage the learners to organize new words according to meaning relationships?
   - Always
   - Often
   - Sometimes
   - Rarely
   - Never

7. Do you encourage learners to organize new words according to derivational relationships? (e.g. employ-employer-employment …)
   Always
   Often
   Sometimes
   Rarely
   Never

8. Do you believe that current examination practices encourage vocabulary learning and maintenance?
   Always
   Often
   Sometimes
   Rarely
   Never

9. Do you believe that the present textbooks encourage vocabulary learning and maintenance?
   Always
   Often
   Sometimes
   Rarely
   Never

10. Does your students' performance reflect their failure to maintain the vocabulary they were exposed to in the previous years?
    Always
    Often
    Sometimes
    Rarely
    Never

11. Does your students' performance reflect their failure to maintain the vocabulary they were exposed to earlier this year?
    Always
    Often
    Sometimes
    Rarely
    Never

PART TWO:

Based on your knowledge of the textbooks, classroom interaction, exercises and examinations, indicate the frequency of the following words in the students' repertoire. Please tick the degree of frequency opposite each word.

	Very Frequent	Frequent	Infrequent	Very Infrequent
academic				
access				
accountant				
accuracy				
accuse				
achievement				
admission				
memory				
background				
garlic				
generation				
goat				
laboratory				
ladder				
laundry				
leadership				
leather				
lecture				
majority				
operation				
accident				
magazine				
management				
occupation				
manufacture				
marketing				
marriage				
martyrdom				
marvelous				
material				
mathematics				
maximum				
measure				
mechanic				
noticeable				
modernization				
quickly				
knowledge				
advertisement				
machine				
absolutely				
achievement				
across				
acquire				
conventional				
conversation				
circumstance				
accommodation				
adequate				
admission				
actually				
additional				

advertisement
alternative
amateur
appointment
anxiety
apparently
appreciate
astronomy
audience
autobiography
avoidance
bilingual
brochure
botanical
calligraphy
celebration
championship
Mediterranean
Neptune
nightmare
optimistic
ornament
physician
trainee
tragedy
triangle
visual
transfer
transitive
translate
translation
transmission
treatment
tropical
twilight
shelter
shipment
signature
sociology
squeeze
stationary
strengthen
stupid
suffocation
suggest
superior
urgent
vacation
vacuum
valley
vegetarian
vehicle
ventilate
veterinary

Thank you very much for your cooperation

APPENDIX 2

Factors Affecting Vocabulary Maintenance
(Students' Questionnaire)

اسم الطالب/الطالبة: ..... الثانوية (الكلية): .....
تليفون (موبايل): ..... الإيميل: .....

الجزء الأول

أ- اكتب(ي) رقم الكلمة الإنجليزية أمام مقابلتها العربية:

1.	autobiography		نبتون
2.	botanical		الاحتفال
3.	calligraphy		البحر الأبيض المتوسط
4.	celebration		البطولة
5.	championship		التسويق
6.	goat		التوقيع
7.	leather		الجلد
8.	lecture		خط اليد
9.	marketing		الأفضل
10.	marriage		الزواج
11.	Mediterranean		السيرة الذاتية
12.	Neptune		الطبيب
13.	noticeable		علم الاجتماع
14.	physician		ماعز
15.	shelter		غبي
16.	signature		يقوي
17.	sociology		المأساة
18.	strengthen		المحاضرة
19.	stupid		الملجأ
20.	superior		ملحوظ
21.	tragedy		نباتي

ب- بين(ي) ما إذا كانت الكلمة مكتوبة بشكل صحيح أم لا :

	صحيح	غير صحيح
absolutly		
academic		
achievement		
aquire		
trainee		
transfere		
transitive		
translation		
transmision		
tringle		

ج- صنف(ي) الكلمات التالية حسب ما تنتمي إليه :

الكلمات	Humans بشر	Places أماكن	Activities نشاطات	Attributes خواص
admission				
advertisement				
amateur				
appreciate				
audience				
goat				
leather				
lecture				
tropical				
urgent				
vacation				
vacuum				
valley				
vegetarian				
vehicle				
ventilate				
veterinary				
visual				
marketing				
marriage				
Mediterranean				
Neptune				
noticeable				
physician				
shelter				

الجزء الثاني

اقرأ(ي) الكلمات الإنجليزية التالية، ثم ضع(ي) علامة صح في الخانة التي تعبر عن رأيك(ي):

الكلمات	هل تتذكر هذه الكلمة؟		هل تعرفت عليها بسرعة؟		هل تتذكر السياق الذي وردت فيه؟		هل تذكرك بكلمات أخرى مشابهة؟		هل تجد صعوبة في نطقها بشكل صحيح؟		هل تجد صعوبة في كتابتها بشكل صحيح؟	
	نعم	لا	نعم	لا	نعم	لا	نعم	لا	نعم	لا	نعم	لا
visual												
advertisement												
suffocation												
laundry												
leadership												
operation												
background												
additional												
treatment												
generation												
translate												
suggest												
ladder												
management												
memory												
material												
accident												
actually												
mathematics												
laboratory												
occupation												
appointment												
maximum												
knowledge												
measure												
across												
machine												
magazine												
mechanic												
conversation												
martyrdom												
bilingual												
apparently												
adequate												
anxiety												
accountant												
squeeze												
admission												
accuracy												
conventional												
access												
manufacture												
alternative												

astronomy							
accommodation							
shipment							
nightmare							
accuse							
circumstance							
garlic							
modernization							
brochure							
optimistic							
ornament							
stationary							
majority							
twilight							
avoidance							
marvelous							

محددات استبقاء الكلمات الإنجليزية المكتسبة في المرحلة الثانوية خلال المرحلة الجامعية لدى المتعلمين السعوديين

فايزة صالح الحمادي

قسم اللغات الأجنبية، كلية التربية، جامعة الملك فيصل،

الأحساء، المملكة العربية السعودية

falhammadi64@yahoo.com

(قدم للنشر في ١٤٢٩/٠١/١٩هـ؛ وقبل للنشر في ١٤٢٩/٠٦/٠٤هـ)

ملخص البحث. يستقصي مشروع البحث الحالي تأثير كل من طول الكلمة، والتعقيد الصرفي/الإملائي، وتكرر الكلمة، ودراسة معاني الكلمات، بالإضافة إلى الفترة الزمنية للاحتفاظ بمفردات الكلمات التي تمت دراستها بالمرحلة الثانوية. تم تكوين عينة الدراسة من ١٥٠ معلماً ومعلمة، بالإضافة إلى ٨٠٠ طالب وطالبة من المرحلة الثانوية، و٦٥٠ طالب وطالبة من المرحلة الجامعية شاركوا في هذه الدراسة المسحية التتابعية. وتم تصميم استبانة تحتوي على ١٣٩ كلمة تختلف حسب معايير التأثير التي سبق ذكرها، وتم تطبيقها على طلاب الثانوية العامة في الفصل الدراسي الأخير لهم بالثانوية ثم إعادة تطبيقها بعد انقضاء الفصل الدراسي الثاني للسنة الأولى بالجامعة بفارق زمني مدته سنة دراسية تقريباً على تطبيق الاستبانة في المرحلة الأولى (الثانوية). ولقد أشارت نتائج البحث إلى أن نسبة استنزاف وفقدان المفردات في حالة متعلمي اللغة الإنجليزية كلغة أجنبية السعوديين جديرة بالملاحظة والاهتمام، وأن الخصائص الأساسية والشكلية لمفردات الكلمات الأجنبية تشكل عاملاً محدداً في الاحتفاظ بالكلمات، كما أنه تم التوصل إلى أن تكرار الكلمة يعتبر عاملاً محدداً ورئيسياً في الاحتفاظ بالكلمات. ولقد أسفرت نتائج الدراسة الحالية عن دعم جزئي لـ"فرضيات الميزة اللغوية" (أندرسن، ١٩٨٢م). على أية حال، يمكن أن يُفترض بأن استنزاف وفقدان المفردات ينتج عن عدد من العوامل المُترابطة التي تتضمن الخصائص الأساسية والشكلية والوظيفية للكلمة، بالإضافة إلى إستراتيجيات التعليم والتعلم المستخدمة.