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An Unsuccessful Search for Intentional Forgetting

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AN UNSUCCESSFUL SEARCH FOR INTENTIONAL FORGETTING

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ABSTRACT

Bjork (1970) reasoned that we must sort the sensory material bombarding us into at least two categories, the relevant and the irrelevant and that we must minimize the interference upon the relevant from the irrelevant. Bjork demonstrated this by instructing people that they could forget some of the material presented them (the irrelevant); intrusions from this material was minimized when they were asked for recall of the rest of the material.

Bjork argued that we sort the relevant and irrelevant into seperate groups and that we devote all memorization effort to learning the relevant. The irrelevant is only weakly in memory and, thus, intrusions from it are unlikely.

The present experiments attempted to test the generality of the phenomenon and to test the adequacy of Bjork's theory. People were presented with single presentations of lists; some lists had an instruction similar to Bjork's. Peoplewere permitted free memorization time, were instructed to rote memorize or to memorize the list into groups (the relevant and the irrelevant) or were denied memorizing time. Words, which are fairly easy to categorize, and nonsense syllables, which are hard to categorize, were used. Bjork's theory would predict that the elimination of intrusions would be strongest when the items of the list were easy to categorize and when people grouped the words. The number of errors in recall of later items (the relevant) due to intrusions from early items (the irrelevant) were compared on the lists with and without the instruction. There were no differences at all. The phenomenon failed to appear.

Other methods of looking at the phenomenon are considered but it is not found to have unquestionably occurred and there is little support for Bjork's theory.

It is concluded that the phenomenon is obtainable onlyunder very specific conditions and that its value to a general theory of human memory is questionable.

AN UNSUCCESSFUL SEARCH FOR INTENTIONAL FORGETTING

INTRODUCTION

Bjork (1970) contended that storage and retrieval processes in memory constantly involve us in two decisions. Recognizing that some of the material bombarding us is worth storing permanently in memory while much other material is discardable, we are constantly faced with the issue, although maybe less than consciously, of what to do with the immediate input. Secondly, we must try to recall from the large permanent storage just that material that is relevant to our immediate needs. Information processing, thus, requires that we sort material into two classes, the irrelevant and the relevant, and that we deal rapidly and ruthlessly with the irrelevant. We wish it neither to occupy processing time nor to interfere with and to distort the relevant material.

Bjork's argument appears plausibe but the questions naturally arise as to whether people actually can sort material in this fashion and, if they can, as to how they go about it. Evidence on the first question, all confirmatory of Bjork's line of reasoning, comes from a number of studies, each employing a somewhat different experimental technique. It may be stated generally, however, that Bjork, LaBerge, & LeGrande (1968), Shebilski, Wilder, & Epstein (1971), and Weiner & Reed (1969) all found that, in a verbal learning task, if a subject in mid-list was told that he could forget all previously presented items (the "forget" cue or

instruction [FCUE]), then he would recall more of the subsequent items correctly than if he was not given an FCUE. The irrelevant and the relevant were sorted out and recall of the relevant was not interfered with by the irrelevant. Bjork (1970), Elmes (1969), Elmes, Adams, & Roediger (1970), Turvey & Wittlinger (1969), and Woodward & Bjork (1971) all employed a more direct technique. They found a decrease in the number of proactive interference intrusions (PII) from the first n number of items in a list upon subsequent items if a FCUE followed the n^{th} item.

Bjork's experiment serves as a representative and more detailed example of the experimental technique. He gave his subjects a paired associates learning task using a nonsense syllable and a word for each pair. Each subject saw between two and eight pairs per list; Bjork then tested his subjects for immediate recall, using a probe technique. On some lists there was an FCUE. He found that when an FCUE was present there were fewer PII upon recall of subsequent items than when it was absent. The phenomenon demonstrated in this particular experiment has been called "intentional forgetting". It is worth pointing out that by PII nothing more is meant than the phenomenon of preceding items appearing in the place of later items in recall; that is, no assumptions are being made about the mechanisms by which this phenonenon occurs.

Bjork's explanation of intentional forgetting can best be understood in terms of Atkinson & Shiffrin's (1968) model of human memory. In this model there is a sensory register, a short

term storage (STS), and a long term storage (LTS). Atkinson & Shiffrin also argue that there are control processes in memory, such as rehearsal and categorization, and that these are under the direction of the subject who is doing the memorizing.

Incoming sensory material enters the sensory register from which it is transferred to STS or, possibly, LTS. Once in STS a trace will last for about 30 seconds before decay has made it completely irretrievable. Also, only about five words can remain in STS at one time. Accordingly, in order for a word to be memorized it must be copied into LTS. It is by the utilization of the control processes that the subject keeps certain words in STS and, thus, increases the probability that the word will enter LTS. One major control process is rote rehearsal, that is, going over a word repeatedly vocally or subvocally. The other processes are categorization and the related chunking processes by which a word is grouped with other words already in LTS under a single category name.

Once the subject wishes to recall a word he must either have it in STS already or he must bring it into STS from LTS. Although the LTS is a relatively permanent storage it is possible for a word to become irretrievable, that is, to be forgotten. Irretrievability occurs when the search process is inadequate to find the necessary word. Interference due to previous and subsequent words is the major source of difficulty. When interference occurs sufficiently the result is that the subject cannot recall the necessary word at all or he recalls an incorrect word that he, nevertheless,

thinks is correct. Interference may be due to acoustical similarity between the target word and the incorrect word, temporal or spatial contiguity in the presentation of the two words, or strong associational bonds between the two words.

Within this framework, Bjork (1970) attempted to explain intentional forgetting. Initially, he presented three hypotheses:

1. There is very rapid decay of the to be forgotten material (TBF). This hypothesis postulates the existence of another control process by which the subject may actively erase or dump material from STS. Hyothesis 1 is called the "dumping" hypothesis. Irrelevant material is intentionally and permanently erased from memory.
2. The subject rehearses only the to be remembered material (TBR). The TBR is thus copied into LTS while the TBF is unintentionally lost because it decays in STS and does not enter LTS. This is the differential rehearsal hypothesis.
3. The subject tags or categorizes or groups the words while they are still in STS into TBR and TBF groups. Both TBR and TBF enter LTS from STS but they are transferred in word-tight compartments. During search and retrieval in LTS the subject searches only through the TBR compartment and, thus, there is little interference from the seperately stored TBF.

Bjork's explanation of intentional forgetting is a combination of hypotheses 2 and 3. He asserted that the TBF and TBR

divided into two categories and that rehearsal time in STS is required to carry out this operation. Once this is done the TBR is rehearsed more than the TBF. Since, however, some rehearsal time was required to organize the TBF, there is some probability that the TBF has entered LTS, although with less strength than the TBR. Within the framework of the Atkinson & Shiffrin model, Bjork would predict that the easier the items were to organize (for example, due to membership in a common superordinate category) and the greater the rehearsal time in STS, the more effective the situation would be in producing intentional forgetting. That is, there would be greater probability that the TBR would be in LTS and that TBR and TBF would be categorized seperately, and thus, the likli-hood of interference of one upon the other would be diminished.

The purpose of the present investigation was to examine the adequacy of Bjork's theory.

If it may be assumed that common English words have greater letter redundancy and thus less information value than do nonsense syllables or trigrams (Miller, Bruner, & Postman, 1954) and if we accept that the less information there is in a series of verbal items, the easier it is to categorize them, then it should follow from Bjork's theory that intentional forgetting should be stronger for a list of words than for a list of trigrams. A second prediction is that for rehearsal to be effective it must involve the categorization and organization of the TBR. That is, merely going over or repeating vocally each word of a list as a discrete

item should produce less effective intentional forgetting.

Unfortunately, the research literature does not present a great deal of evidence concerning these predictions from Bjork's theory. The phenomenon has been demonstrated in studies employing low information items and permitting rehearsal (Bjork, 1970; Elmes, 1969: Elmes et al., 1970) as well as in studies employing high information items and prohibiting rehearsal (Turvey & Wittlinger, 1969). Further, different investigators have used different instructions. Woodward & Bjork (1971) told their subjects to erase the TBF from memory; Turvey & Wittlinger (1969) told their subjects only that they need remember the TBR; no mention was made of forgetting. Bjork(1970) combined the two types of instructions.

Accordingly, although the overall intent of the present investigation was to test the three hypotheses, particularly Bjork's, concerning intentional forgetting, the first experiment was in large part an attempt to delineate more clearly the laboratory conditions under which the phenomenon occurs. That is, the first experiment attempted to define the limits and test the generality of intentional forgetting across various conditions. The two types of instructions were compared as were two conditions of rehearsal (no rehearsal and free rehearsal time) and two conditions of information load (words and trigrams). What was unique about the experiment was that all the combinations of these conditions were examined within the framework of a single experiment.

Once again, the prediction from Bjork's theory was that

the greater the opportunity for rehearsal and the less the information load, the greater is the liklihood of obtaining intentional forgetting.

EXPERIMENT 1

Method

Subjects The subjects were 20 men and 20 women students in the introductory psychology course at the College of William and Mary. All subjects were unpaid volunteers.

Apparatus The experimental lists were presented to the subjects on a Lafayette Memory Drum.

Materials Each subject was shown 40 lists: 20 composed of words and 20 composed of consonant-vowel-consonant trigrams. There were 16 words lists composed of 4 lists with each of six, seven, eight, or nine items and there were 16 trigrams lists composed of 4 lists with each of six, seven, eight, or nine items. The remaining 8 lists, the practice lists, were half words lists and half trigrams lists and each list length was represented twice. Differing list lengths were used merely as a control and no predictions were made concerning list length and the facilitation of intentional forgetting.

The words were four letter, single syllable English nouns. Each list was composed of approximately an equal number of words of low frequency of usage (0 to 10 instances per million), according to the Lorge-Thorndike tables (Thorndike & Lorge, 1944), of moderate frequency (11 to 49) and of high frequency (50 to 100). No word appeared twice to any one subject and no two words with the same

initial letter appeared in the same list. Within these restrictions the words were randomly assigned to the lists.

The trigrams were chosen from the Archer norms (Archer, 1960) in the range of 40 to 60 on the Archer scale of meaningfulness (the middle range). No trigrams which were English words were employed but all trigrams were pronounceable. The same restrictions were placed on the trigrams as placed on the words and they were randomly assigned to the lists.

The words and trigrams were typed in block capitals, one above the other.

Half of the subjects were in a no rehearsal condition. The task designed to limit rehearsal was the adding together of two single digit numbers. A set of numbers accompanied each item for each list; they were typed beside and to the right of each item. The numbers were randomly chosen. Each subject was required to add the numbers, say the answer out loud, and say whether the answer was an even or an odd number. Posner & Rossman (1965) have shown that this task effectively keeps subjects from attending to preceding items.

The FCUE was a red line drawn with a pencil and placed between the two appropriate items so that it was not seen until all the TBF items had passed.

Appendix A presents the stimulus lists that were actually used. The numbers, which were presented only to the half of the subjects in the no rehearsal condition, are also shown.

Procedure Subjects were randomly assigned to one of the two instruction conditions and to one of the two rehearsal conditions with the restriction that there be an equal number of men and women in each of the four possible conditions.

Each subject was tested individually.

In the rehearsal condition the subject saw each item for one second; then there was a two second inter-item delay and the subsequent item appeared. In the no rehearsal condition the subject also saw the numbers and was required to do the no rehearsal task during the two second inter-item duration.

Half of the lists each subject saw were words lists and half were trigrams lists. The lists were presented in such a fashion that the subject never knew ahead of time whether the next list was a words list or a trigrams list.

Half of the lists for each subject contained an FCUE. This instruction fell an equal number of times on lists representing the eight possible combinations of rehearsal, instructions and information load. On the lists on which it fell there were always five items after the FCUE. Accordingly, on the lists with six items there was one item before the FCUE, the red line, and on the seven, eight and nine item lists there were two, three, or four items respectively before the FCUE.

Subjects never knew before any particular list was presented if and when an FCUE would appear. Nor did they know how many items any particular list would have. Accrdinly, a subject

attempting to get as many items correct as possible could not ignore the first items of a list since he did not know until those had passed whether an FCUE would appear or not.

After each list had gone by subjects were asked for serial ordered recall of the items of the list, that is, either all of them or, if it appeared, just those after the FCUE. Subjects wrote down their responses on supplied data sheets.

The instructions for the group which attempted to actively erase the TBF were as follows:

> "This is a study into the way in which people remember things.
> "You will be shown on the apparatus in front of you, a memory drum, a series of lists. The lists will be of varying lengths and will consist of either four letter English nouns or trigrams (three letter items which do not spell English words). All the items for any one list will be either words or trigrams, but never both.
> "After each list has gone by you will be asked to recall some or all of the items of the list, the words or trigrams. You are to write down on the pieces of paper in front of you the items of the list. You will be given a seperate piece of paper for each list. You are to write down the first word you saw on the first blank, the second word on the second blank, etc. Write down the items you remember best immediately and then go back to the harder ones after. If you do not remember an item exactly, then try to make a guess at it.
> "For some lists you will be requested to remember all the items of the list. On some lists, however, you will see a red line appear above one of the items of the list. You are to remember that item and subsequent items but you are requested to actively forget the items preceding the red line. You will be asked to recall only the items after the red line. Try to erase from memory what came before the red line. On these lists there will always be five items after the red line.

> "If the line appears after the third word, you are being asked to erase from memory the first three items. On the answer sheet you are to write down the five items that came after the red line, starting on the fourth blank. If the red line appeared after the second word, you would begin on the third blank, of course.
> "Are there any questions?"

The instructions to the group that was told only that they would be required to remember what came after the FCUE but were told nothing about forgetting were the same as the above until the third sentence in the third paragraph. Their instructions from that point read:

> "You are to remember only that item and subsequent items because you will be asked to recall only the items after the red line. On these lists there will always be five items after the red line."

In the next paragraph the "you are being asked to erase from memory the first three items" was deleted and the preceding "if" clause was tagged onto the front of the following sentence.

The subjects in the no rehearsal group were also read the following:

> "One other point. Beside each word or trigram you will see two single digit numbers. Between the time you see one item and you see the next, you are requested to rapidly add the two numbers together, say the answer out loud and say whether the sum is an odd number or an even number."

In order to be certain that subjects did attend to the addition task, the experimenter monitored their responses. A subject who achieved less than 75% of the additions correct was dropped from the study. In this case another subject was run.

Experiment 1

Results and Discussion

Only one of the 20 men subjects had to be replaced for failure to attend to the addition task. No women subjects had to be replaced.

As stated earlier, an instance of PII is defined as the incorrect recall of item X when the recall of item Y, which was subsequent to X in the initial presentation of the stimulus list, would have been appropriate. In this experiment only those PII from before the FCUE were considered. On those lists with no FCUE only those PII from serial positions corresponding to those before the FCUE on FCUE lists were considered. That is, on a list with seven items, only PII from the first two positions (those before the FCUE on FCUE lists) were employed in the data analysis. Similarly, on lists with six items only PII from the first position were used and on lists with eight and nine items, only PII from the first three or four items respectively were used. Thus the effectiveness of the FCUE in producing intentional forgetting could be considered.

For this experiment, an intrusion was considered an instance of PII only if the intruding item was from the same list. That is, intrusions from earlier lists of the experiment were not considered PII. Such a definition of PII was employed because it was the elimination of such intrusions that constituted the

phenomenon that Bjork demonstrated and attempted to explain.

Appendix B shows each instance of PII for each subject and for each of the sixteen conditions of the experiment. What was most noteworthy was the small number of PII. There were only 42 out of a possible 6,400 (the total number of responses after a FCUE and on corresponding positions on no FCUE lists, summed across all subjects).

Clearly, most instances of PII occurred on the two longer list lengths (74%). Accordingly, because there were so few instances of PII and there were no predictions made concerning list length, it was decided to sum the number of PII across list length.

It was obvious from an inspection of the data that the task was differentially difficult under the various combinations of conditions. Accordingly, in order to compare the facilitation of intentional forgetting across conditions it was necessary to convert the number of PII into percentages of the total errors under each particular combination of conditions. Appendix C shows the data on PII summed across list length and converted into percentages.

Although the large number of zeros in the data seriously strained the assumption of normally distributed scores, an analysis of variance was performed on the data. A two-between subjects variables (rehearsal conditions and instruction conditions) and two-within subjects variables (information load conditions and FCUE conditions) type of analysis was done. Such an analysis was necessary in order to examine the interactions which, as stated earlier, was

a major purpose of the study.

A second problem with the data needs to be pointed out. The use of percentages with small numbers has created a distortion. For example, if both subjects A and B made one interference and one omission error on a list of nine items and if A put item seven in item six's place, then he made a retroactive error and his percent of PII is 0/2 or 0%; if B put item one in item six's place, however, he made a PII and his percent of PII is 1/2 or 50%. The result is that very small differences in behavior have produced very large quantitative differences.

However, these difficulties did not lead to problems of interpretation in the results. Table 1 shows a summary of the analysis of variance. The only significant Fs were for the information load variable and for a higher order interaction among the rehearsal conditions, instructions, and information load.

Table 2 presents the means relevant to the interaction which was significant with $F(1,36)=5.36$, $p<.05$. What the interaction states is that there were more PII in the free rehearsal condition when subjects had been instructed to erase than when they had been instructed only to remember what came after the FCUE. However, under the no rehearsal condition there were more PII for the latter subjects than for the former. This relationship held only for words, however. When the items were trigrams the relationship between rehearsal condition and instruction condition was reversed. This interaction was not predicted and it was very

TABLE 1

EXPERIMENT 1: ANALYSIS OF VARIANCE FOR PII

SOURCE	DF	MS	F
BETWEEN SUBJECTS	39		
A (REHEARSAL)	1	17.29	1.28
C (INSTRUCTIONS)	1	11.44	0.84
AC	1	8.19	0.60
ERROR A	36	13.47	
WITHIN SUBJECTS	120		
B (FCUE)	1	8.64	0.41
AB	1	53.13	2.51
BC	1	1.93	0.09
ABC	1	37.05	1.75
ERROR B	36	21.11	
D (INFO. LOAD)	1	552.79	51.47 **
AD	1	0.01	0.01
CD	1	8.93	0.83
ACD	1	57.60	5.36 *
ERROR D	36	10.73	
BD	1	4.03	0.21
ABD	1	14.16	0.74
BCD	1	6.32	0.33
ABCD	1	21.31	1.11
ERROR BD	36	19.06	

* $p<.05$
**$p<.001$

TABLE 2

EXPERIMENT 1: MEAN NUMBER OF PII ERRORS FOR THE INTERACTION OF INFORMATION LOAD, REHEARSAL CONDITION, AND INSTRUCTIONS

	REHEARSAL		NO REHEARSAL	
	A. E.	R. O.	A. E.	R. O.
WORD	12.22	6.90	7.56	8.85
TRGM	1.40	2.77	1.62	0.0

A. E. : INSTRUCTION TO ERASE TBF

R. O. : INSTRUCTION TO REMEMBER TBR

WORD : WORDS LISTS

TRGM : TRIGRAMS LISTS

unclear what it meant in terms of Bjork's theory.

The significant main order effect was not consistent with Bjork's theory. There was a larger mean percentage of PII for words lists (35%) than for trigrams lists (6%). This difference was significant ($F(1,36)=51.48$, $p<.001$). The conclusion would seem to be that PII are more likely to occur with low than with high information items. Possibly high information items supply more categorization possibilities than do low information items and thus facilitate storage and minimize interference. However, there is another more plausible explanation. In order for an error to be a PII it must have been a correctly spelled intrusion from an earlier part of the list. As Appendix D points out, there were far more errors for trigrams lists than for words lists. Subjects simply did not recall enough trigrams correctly to produce any substantial number of PII. The words were easier and, thus, PII were more likely. The conclusion suggests itself that the probability of a type of error being made in recall of a list is a function of the difficulty of the list.

The failure to obtain a significant F for the FCUE:no FCUE conditions indicated that intentional forgetting did not occur ($F(1,36)<1$). The findings were in the predicted direction, however; the mean percentage of PII for the FCUE lists was 18.8% while it was 22.5% for the no FCUE lists.

Similarly, the results for the rehearsal condition variable did not reach significance ($F(1,36)=1.28$, $p<.20$). They were

not even in the predicted direction; PII were 23.9% of the errors in the free rehearsal condition and only 18.03% in the no rehearsal condition.

The results for the instruction condition variable did not reach significance ($F(1,36)<1$). The mean percentage of PII for the subjects instructed to erase the TBF was 22.80% while it was 18.52% for the subjects told only that they need remember the TBR. There is, thus, no evidence that the different instructions have different effects.

At this pont it was decided that it might be of value to examine omissins in addition to PII. Theoretically, proactive interference as a mechanism is thought to produce both errors of omission and comission (Wickens, 1970). Accordingly, omissions (OM) and PII were combined and the analysis of variance was repeated. The data was aqain summed across list length and was in the form of PII + OM errors as a percentage of total errors. The data is presented in Appendix C

Difficulties concerning the use of data with zeros and small numbers were lessened considerably since there were a large number of OM errors.

The problem with OM errors is that they reflect more recall difficulties than just proactive interference. They may be due to retroactive interference, decay, or the timidity of a subject who knows the right answer but who refuses to give it because he is uncertain of its correctness. Accordingly, the results of

TABLE 3

EXPERIMENT 1: ANALYSIS OF VARIANCE FOR PII + OM

SOURCE	DF	MS	F
BETWEEN SUBJECTS	39		
A (REHEARSAL)	1	47265.625	141.29 **
C (INSTRUCTIONS)	1	831.744	2.48
AC	1	534.361	1.59
ERROR A	36	334.510	
WITHIN SUBJECTS	120		
B (FCUE)	1	9551.190	40.24 **
AB	1	5902.470	24.86 **
BC	1	5.256	0.02
ABC	1	82.082	0.34
ERROR B	36	237.337	
D (INFO. LOAD)	1	620.156	4.51 *
AD	1	665.040	4.83 *
CD	1	416.670	3.03
ACD	1	382.542	2.78
ERROR D	36	137.409	
BD	1	857.476	5.40 *
ABD	1	439.569	2.77 *
BCD	1	256.036	1.61
ABCD	1	605.284	3.81
ERROR BD	36	158.570	

*p<.05
**p<.001

the analysis are of questionable validity as evidence concerning the mechanisms underlying intentional forgetting.

However, the analysis produced interesting results. Table 3 presents a summary of the analysis of variance.

The FCUE:no FCUE variable was significant ($F(1,36)=40.24$, $p<.001$) and the means were in the predicted direction; that is, the mean percentage of PII + OM errors under the FCUE condition was 42.67% while it was 55.04% for the no FCUE condition. Intentional forgetting appeared to have occurred and Bjork's phenomenon to have been replicated.

The free rehearsal condition produced 35.10% PII + OM errors while the no rehearsal condition produced fully 62.60% PII + OM errors. This difference was significant ($F(1,36)=141.29$, $p<.001$). This difference is in the predicted direction and indicates that prohibiting rehearsal increases the probability of PII + OM.

The words lists again produced more errors (50.43%) than the trigrams lists (47.28%). The difference again was significant ($F(1,36)=4.51$, $p<.05$). The most plausible explanation is the same one used in the previous analysis: that subjects did not get enough items correct in the trigrams lists to make PII. Here, the addition of OM errors has not eliminated the difference seen in the previous analysis.

The difference between the instruction conditions is not significant ($F(1,36)=2.48$, $p>.10$). The mean percentage of PII + OM errors for the subjects told to erase the TBF was 50.43% while the

percentage was 47.28% for the subjects who were told nothing about forgetting but only that they need remember the TBR. It seems a safe conclusion that these two types of instructions do not have differing effects.

There were three significant interactions.

As Table 4 indicates, the differences in the percentage of PII + OM errors between the FCUE lists and the no FCUE lists is a function of the rehearsal condition ($F(1,36)=24.86$, $p<.001$). It would appear that intentional forgetting has occurred primarily with the free rehearsal time condition rather than with the no rehearsal condition. This finding is consistent with Bjork's theory which states that rehearsal time is necessary to achieve categorization and, finally, intentional forgetting.

Table 4 also points out that the number of PII + OM errors found in the free rehearsal condition and the no rehearsal condition is a function of information load. This interaction was significant ($F(1,36)=4.83$, $p<.05$). In the no rehearsal condition there were slightly more PII + OM errors for trigrams than for words; in the free rehearsal condition, however, there were more such errors for words than for trigrams. An explanation might be that the very difficult no rehearsal task produced a large number of errors regardless of information load. However, under the easier free rehearsal condition subjects may have begun to recall enough words in order to produce PII errors, while they were still unable to recall trigrams correctly. The number of PII + OM errors for the trigrams is kept down by the presence of retroactive errors and misspellings, the

TABLE 4

EXPERIMENT 1 : MEAN PERCENTAGE OF PII + OM ERRORS AT EACH LEVEL OF THE REHEARSAL, FCUE, AND INFORMATION LOAD CONDITIONS.

	REHEARSAL		NO REHEARSAL	
	FCUE	NO FCUE	FCUE	NO FCUE
WORD	30.12	65.66	75.87	80.49
TRGM	30.0	49.70	77.33	79.32

FCUE : FORGET CUE LISTS

NO FCUE : NO FORGET CUE LISTS

WORD : WORDS LISTS

TRGM : TRIGRAMS LISTS

latter very uncommon with the words.

Table 4 also points out the difference in the number of PII + OM errors between the words lists and the trigrams lists is a function of the presence of a FCUE; this interaction was significant ($F(1,36)=5.40$, $p<.05$). On the lists with a FCUE there were slightly more PII + OM errors on trigrams lists than on words lists; however, when there was no FCUE, there were decidedly more PII + OM errors on words lists than on trigrams lists. Bjork's theory would have predicted substantially more PII + OM errors on trigrams lists than on words lists.

Although these results are interesting and generally confirmatory of Bjork's theory, they are of questionable validity as evidence pertaining to it. It was necessary to demonstrate intentional forgetting using PII alone, as Bjork and other investigators had. Accordingly, a second experiment was run in hope of obtain-intentional forgetting.

In the second experiment those conditions were used which in experiment one seemed most conducive to producing PII and, thus, most likely to produce intentional forgetting. Words were used solely since trigrams made the task too difficult and few PII occurred. A combination of the two instructions was employed. Bjork's theory would predict rehearsal time devoted to categorization would be more effective in producing intentional forgetting than rote rehearsal. Accordingly, these two types of rehearsal were employed and compared in the second experiment. Lastly, all experimental lists were nine items long; shorter lists did not produce PII.

A new condition was added in this experiment. The dumping hypothesis states that subjects can intentionally erase material from STS. Accordingly, in this experiment, on a very few lists, subjects were tricked and asked to recall the TBF. The dumping hypothesis would predict that the TBF would be wiped out. Bjork's theory would predict that some of the TBF would be retrievable.

This experiment used a probe technique to lessen the effects of response interference upon recall.

Experiment 2

Method

Subjects The subjects were 18 men and 18 women students in the introductory psychology course at the College of William and Mary. All subjects were volunteers and all were paid $1.60.

Apparatus The experimental lists were presented to the subjects on a Lafayette Memory Drum.

Materials Each subject saw 42 lists composed of nine, four letter, single-syllable English nouns. He also saw 6 lists composed of nine three letter nouns-these latter lists were practice lists.

Each list was composed of words equated for frequency of usage, as in experiment one. No word appeared twice to any one subject and no words with the same initial letter appeared in the same list. Within these restrictions the words were randomly assigned to the lists.

The words were typed in block capitals, one above the other. Each word appeared for one second and there was a one second interword duration. After the last word had gone by, the probe instruction appeared. The word preceding the target word was used as the probe. However, if the first word of the list was to be probed, the words "First Word" were typed in; if the word immediately following the FCUE was the target, then the words "Red Line" appeared. Subjects wrote down their responses on supplied data sheets.

The FCUE was a red line drawn with a pencil between the two appropriate items so that it was not visible until all the TBF had passed.

On 9 lists the FCUE fell after the second word; on 8 lists it fell after the third word; on 7 lists it fell after the fourth word. There was no FCUE on the remaining 18 lists. Using different numbers of words before the FCUE was essentially a control condition to increase the validity of any results. Since no differential hypotheses were made concerning the number of words before the FCUE, it may also be considered a replication condition.

On the 18 lists with no FCUE each of the nine serial positions was probed twice. On the 9 lists with the FCUE after the second word each position was probed once. On the 8 lists with the FCUE after the third word, each of the six positions after the FCUE was probed once; for each subject, two of the three positions before the FCUE were probed once. Across all subjects each of these three positions was probed an equal number of times. With lists on which the FCUE fell after the fourth word, each positionafter the FCUE was probed once; two of the four positions before the FCUE were probed once for each subject. Again, across all subjects all four positions were probed an equal number of times.

In all, each subject was given six lists on which he was given a FCUE but after which he was asked for a word before the FCUE. These trials were called illegal trials. The 27th, 32nd, 33rd, 41st, 45th, and 46th trials were randomly chosen to be the illegal

trials. Although subjects were told ahead of time that there would be such trials, they were not told when they would occur; they found out that a trial was an illegal trial only if they discovered for themselves that they were being asked to recall a word from before the FCUE.

Subjects, of course, were not aware whether or not a FCUE would appear on any list until it actually presented itself. Thus subjects attempting to do well could not afford to ignore the first words since they were never made aware ahead of time whether they might be asked for them in a genuine no FCUE trial.

The decision to inform subjects that illegal trials would be used was based on several considerations. In previous work the experimenter found that unexpected illegal trials produced bewilderment and confusion on the part of the subject. The result was considerable interference with the whole task of recall. The subject, also, became very wary of the experiment; he had been tricked once, so why not again. By informing the subject that they would occur and requesting that he act as if he would be tested only on the post FCUE words, the bewilderment and the distrust were, hopefully, eliminated. Secondly, by keeping the number of such trials down and by placing them in the latter half of the experiment, it was hoped that subjects would not anticipate them. The set to use a successful strategy, that is, to concentrate only on the TBR presumably would be so strong by the second half of the experiment that the occasional illegal trial would not induce the subject to adopt a more difficult and generally less efficient strategy, that is, remembering

all words regardless of whether a FCUE appeared or not. To test whether subjects were even aware of the illegal trials, the subjects were asked after the experiment to guess how many of them had occurred.

Appendix E presents the stimulus materials actually used in the experiment.

Procedure Each subject was tested individually.

Each subject was assigned to either the rote or categorization rehearsal condition with the restriction that there be an equal number of men and women in each rehearsal condition.

The subjects in the rote condition were requested to repeat out loud, three times, each of the words as it passed. They were specifically requested not to rehearse the words previous to the one immediately in front of them.

The categorization condition required a rehearsal task which could be monitored by the experimenter. Accordingly, the subject was asked to group the words into two categories, the TBR and the TBF. Of course, if there was no FCUE, then the whole list formed one TBR group. The subject was requested to say out loud, during the inter-word duration, and in serial order, as many as possible of the words of the category being rehearsed. Thus, the subject would have constructed one or two categories, the TBF and/or the TBR, by building a chain. The subject, of course, rehearsed different segments of the chain over and over again. There is evidence that this type of categorization does go on in successful intentional forgetting experiments without the subjects being

specifically instructed to so rehearse (Elmes & Wilkinson, 1971).

The subjects in the rote condition were read the following instructions:

> "This is a study into the way in which people remember things.
>
> "You will be shown on the apparatus in front of you, a memory drum, a series of lists. Each list will be composed of nine words. You will see each word for one second.
>
> "When you see a word, you are requested to say the word out loud, three times, before the subsequent word appears. Concentrate on the word before you at all times and do not go back over the preceding words of the list.
>
> "After each list has gone by you will see a word or words appear. If you see a word of the list, then you are to write down on the answer sheet, the word that followed it in the list. If you see the words "First Word" you are to write down the first word of the list. If you see the words "Red Line", then you are to write down the word that immediately followed the red line. The red line will appear between two of the words and will appear on some of the lists only.
>
> "For some lists you may be requested to remember any one of the words. On some of the lists, however, you will see a red line appear above one of the words. The red line means that you will be asked to recall only a word that comes after the red line. You may forget the words before the red line because you will not be requested to remember any of them.
>
> "There is one exception. On a very few occasions you will be asked to recall one of the words before the red line. It is stressed, however, that this will happen only a couple of times and mostly near the end of the experiment.
>
> "Are there any questions?"

The subjects in the categorization condition received identical instructions except that the third paragraph was deleted and the following was inserted before the last paragraph.

> "When you see the first word, say it out loud. When you see the second word, say both the first and the second words. Similarly, after the third word has passed, say the first, second, and third words. During each interval between words try to go over the previous words of the list. Go over as many as you can and remember to rehearse the words out loud. When you see the red line, stop going over the words before it. Start all over again with the words after the red line."

After the experimental lists had gone by the subject was asked to guess how many illegal trials there had been.

Experiment 2

Results and Discussion

Appendix F shows each instance of PII for each subject for each condition of the experiment. PII were defined as in experiment one; omissions were not considered. Again, it was noted that there were few PII errors: 68 in all out of a possible 1,296 (the total number of probes of positions after a FCUE and of corresponding positions on no FCUE lists).

Since the various combinations of conditions obviously produced differentially difficult tasks, it was necessary again to convert the number of PII errors into percentages of the total errors under each particular combination of conditions. It was then possible to compare the number of PII errors across various conditions of the experiment.

For each subject the 7 lists with the FCUE after the second word were compared to the 14 no FCUE lists on which the third through ninth positions were probed. Similarly, the 6 lists with the FCUE after the third word were compared to the 12 no FCUE lists which probed the fourth through ninth positions. The 5 lists with the FCUE after the fourth word were compared to the 10 no FCUE lists on which the fifth through ninth positions were probed. It can be seen then that many of the same lists were employed in all three comparisons. Also, it is noted that there were twice as many probes

and, therefore, twice as many data points in the no FCUE condition.

The difficulties encountered in experiment one with zeros in the data and with percentages derived from small numbers must again be taken into consideration. An analysis of variance was performed on these data to determine if one or other of the rehearsal conditions produced more PII and to determine if there was less PII with a FCUE than without one; that is, if intentional forgetting occurred. The appropriate analysis was a one-between subjects variable (rehearsal condition) and a one-within subjects variable (FCUE conditions) type analysis. Three seperate analyses were performed, one for each of the sets of lists with two, three, or four words before the FCUE.

Tables 5, 6, and 7 present a summary of the three analyses.

Clearly, intentional forgetting did not occur in this experiment. When the FCUE came after the second word 7.28% of the errors after the FCUE were PII, while 12.50% of the errors on corresponding positions on no FCUE lists were PII. This difference, although in the expected direction, was not significant ($F(1,34)=2.13$, $p>.10$). When the FCUE fell after the third word, PII were 10.61% of the total errors on the FCUE lists as against 14.28% on the no FCUE lists. Again, this difference was not significant ($F(1,34)<1$). In the case of the FCUE falling after the fourth word, there were actually more PII after the FCUE (23.88%) than on corresponding positions on no FCUE lists (14.58%). This difference, which is the opposite of what was predicted, was not significant ($F(1,34)<1$).

TABLE 5

EXPERIMENT 2: ANALYSIS OF VARIANCE FOR PII (FCUE AFTER 2ND WORD)

SOURCE	DF	MS	F
BETWEEN SUBJECTS	35		
A (REHEARSAL)	1	13.336	0.110
ERROR A	34	117.413	
WITHIN SUBJECTS	36		
B (FCUE)	1	300.125	2.134
AB	1	91.125	0.648
ERROR B	34	140.595	

TABLE 6

EXPERIMENT 2: ANALYSIS OF VARIANCE FOR PII (FCUE AFTER 3RD WORD)

SOURCE	DF	MS	F
BETWEEN SUBJECTS	35		
A (REHEARSAL)	1	334.73	1.080
ERROR A	34	312.325	
WITHIN SUBJECTS	36		
B (FCUE)	1	241.870	0.641
AB	1	76.48	0.202
ERROR B	34	377.342	

TABLE 7

EXPERIMENT 2: ANALYSIS OF VARIANCE FOR PII (FCUE AFTER 4TH WORD)

SOURCE	DF	MS	F
BETWEEN SUBJECTS	35		
A (REHEARSAL)	1	1556.816	1.31
ERROR A	34	1180.627	
WITHIN SUBJECTS	36		
B (FCUE)	1	32.285	0.04
AB	1	1235.039	1.87
ERROR B	34	685.864	

The three analyses also indicated that the two rehearsal conditions did not produce different numbers of PII. Table 8 presents the relevant means. No differences were significant, as can be seen from the summaries of the analyses of variance.

These three analyses were all repeated using PII + OM errors, with omissions defined as in experiment one. Appendix G presents the data that was used. Tables 9, 10, and 11 give summaries of these analyses. There were no significant differences. Table 12, which shows the means for the main effects, indicates that for the FCUE:no FCUE condition the means in all three analyses were in the predicted direction; that is, there was a larger percentage of PII + OM errors on no FCUE lists than on FCUE lists.

It may be concluded, then, that experiment two has not replicated Bjork's phenomenon. It is possible, however, by looking at the illegal trials to find some evidence pertaining to his theory.

From Appendix F the number of correct responses for the no FCUE lists and for the illegal trials can be determined. In the rote rehearsal condition, 10.19% of the response on the illegal trials were correct; on the other hand, 16.66% of the responses on corresponding positions on no FCUE lists were correct. This difference was significant ($t(17)=2.43$, $p<.05$). Similarly, in the categorization rehearsal condition 14.82% of the responses on the illegal trials were correct as aginst 27.77% of the responses to corresponding items on no FCUE lists. This difference was also significant

TABLE 8

EXPERIMENT 2: MEAN PERCENTAGE OF PII ERRORS FOR THE ROTE AND CATEGORIZATION REHEARSAL CONDITION, BY PLACEMENT OF THE FCUE

	ROTE	CATEGORIZATION
FCUE AFTER THE 2ND WORD	5.94	6.81
FCUE AFTER THE 3RD WORD	19.35	5.66
FCUE AFTER THE 4TH WORD	19.91	18.56

TABLE 9

EXPERIMENT 2: ANALYSIS OF VARIANCE

FOR PII + OM (FCUE AFTER 2ND WORD)

SOURCE	DF	MS	F
BETWEEN SUBJECTS	35		
A (REHEARSAL)	1	1064.91	2.78
ERROR A	34	382.753	
WITHIN SUBJECTS	36		
B (FCUE)	1	232.919	0.640
AB	1	95.908	0.260
ERROR B	34	365.464	

TABLE 10

EXPERIMENT 2: ANALYSIS OF VARIANCE

FOR PII + 0M (FCUE AFTER 3RD WORD)

SOURCE	DF	MS	F
BETWEEN SUBJECTS	35		
A (REHEARSAL)	1	32080.370	3.56
ERROR A	34	9020.313	
WITHIN SUBJECTS	36		
B (FCUE)	1	7519.438	1.09
AB	1	574.500	0.08
ERROR B	34	6871.754	

TABLE 11

EXPERIMENT 2: ANALYSIS OF VARIANCE

FOR PII + OM (FCUE AFTER 4TH WORD)

SOURCE	DF	MS	F
BETWEEN SUBJECTS	35		
A (REHEARSAL)	1	3826.648	2.99
ERROR A	34	1276.441	
WITHIN SUBJECTS	36		
B (FCUE)	1	173.906	0.157
AB	1	424.895	0.384
ERROR B	34	1106.417	

TABLE 12

EXPERIMENT 2: MEAN PERCENTAGE OF PII + OM ERRORS FOR REHEARSAL CONDITION, FCUE CONDITION, AND NUMBER OF WORDS BEFORE THE FCUE

	2		3		4	
	ROTE	CATEG	ROTE	CATEG	ROTE	CATEG
FCUE	21.1	11.1	45.8	9.25	37.0	17.6
NO FCUE	22.4	17.0	71.9	24.0	35.3	25.6

ROTE: ROTE REHEARSAL CONDITION

CATEG: CATEGORIZATION REHEARSAL CONDITION

2: FCUE CAME AETER 2ND WORD

3: FCUE CAME AFTER 3rd WORD

4: FCUE CAME AFTER 4th WORD

FIGURE 1

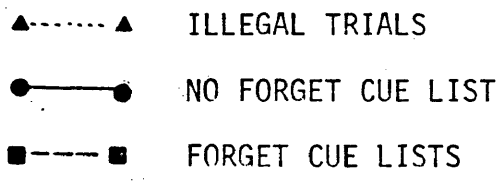
NUMBER OF WORDS CORRECT AT EACH SERIAL POSITION BY REHEARSAL CONDITION (FCUE AFTER 2ND WORD)

CATEG: CATEGORIZATION REHEARSAL CONDITION

ROTE: ROTE REHEARSAL CONDITION

IT: ILLEGAL TRIALS

FCUE: PLACEMENT OF THE FORGET INSTRUCTION



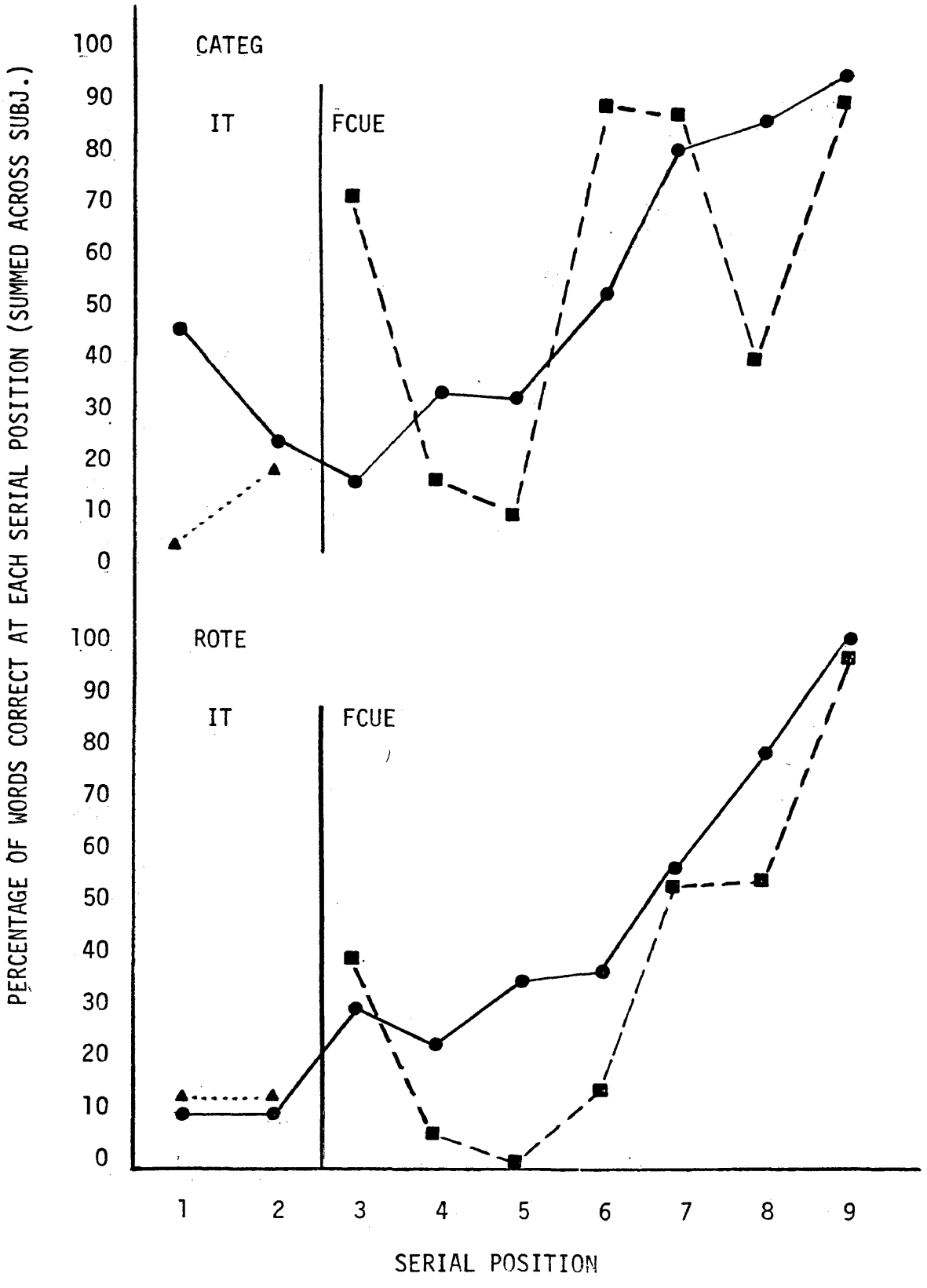

CATEG
IT
FCUE
ROTE
IT
FCUE
100
90
80
70
60
50
40
30
20
10
0
1
2
3
4
5
6
7
8
9
PERCENTAGE OF WORDS CORRECT AT EACH SERIAL POSITION (SUMMED ACROSS SUBJ.)
SERIAL POSITION

FIGURE 2

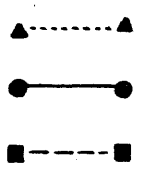
NUMBER OF WORDS CORRECT AT EACH SERIAL POSITION BY REHEARSAL CONDITION (FCUE AFTER 3RD WORD)

CATEG: CATEGORIZATION REHEARSAL CONDITION

ROTE: ROTE REHEARSAL CONDITION

IT: ILLEGAL TRIALS

FCUE: PLACEMENT OF THE FORGET INSTRUCTION



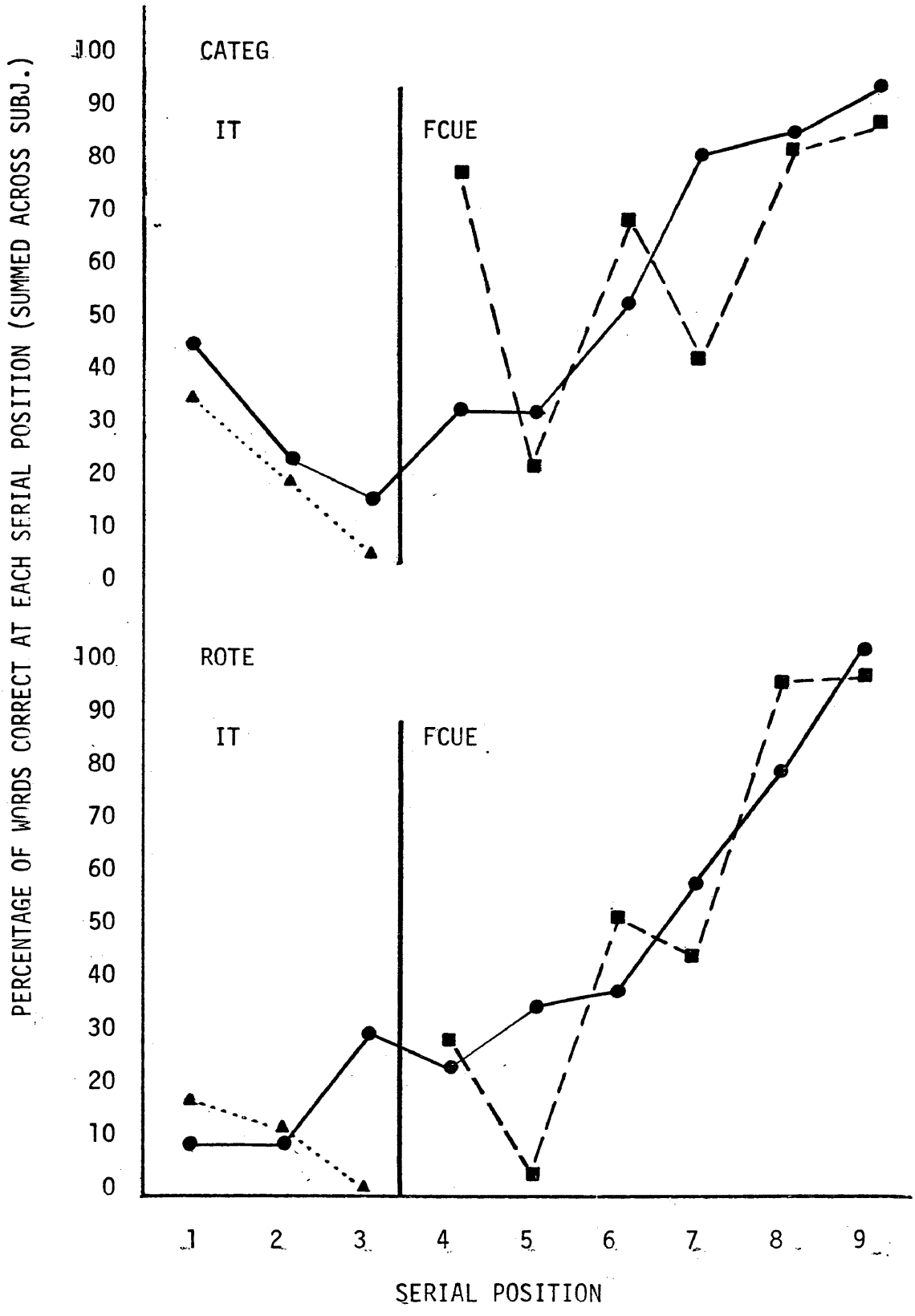

CATEG
IT
FCUE
ROTE
IT
FCUE
PERCENTAGE OF WORDS CORRECT AT EACH SERIAL POSITION (SUMMED ACROSS SUBJ.)
100
90
80
70
60
50
40
30
20
10
0
1
2
3
4
5
6
7
8
9
SERIAL POSITION

FIGURE 3

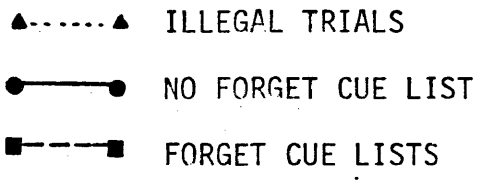
NUMBER OF WORDS CORRECT AT EACH SERIAL POSITION BY REHEARSAL CONDITION (FCUE AFTER 4TH WORD)

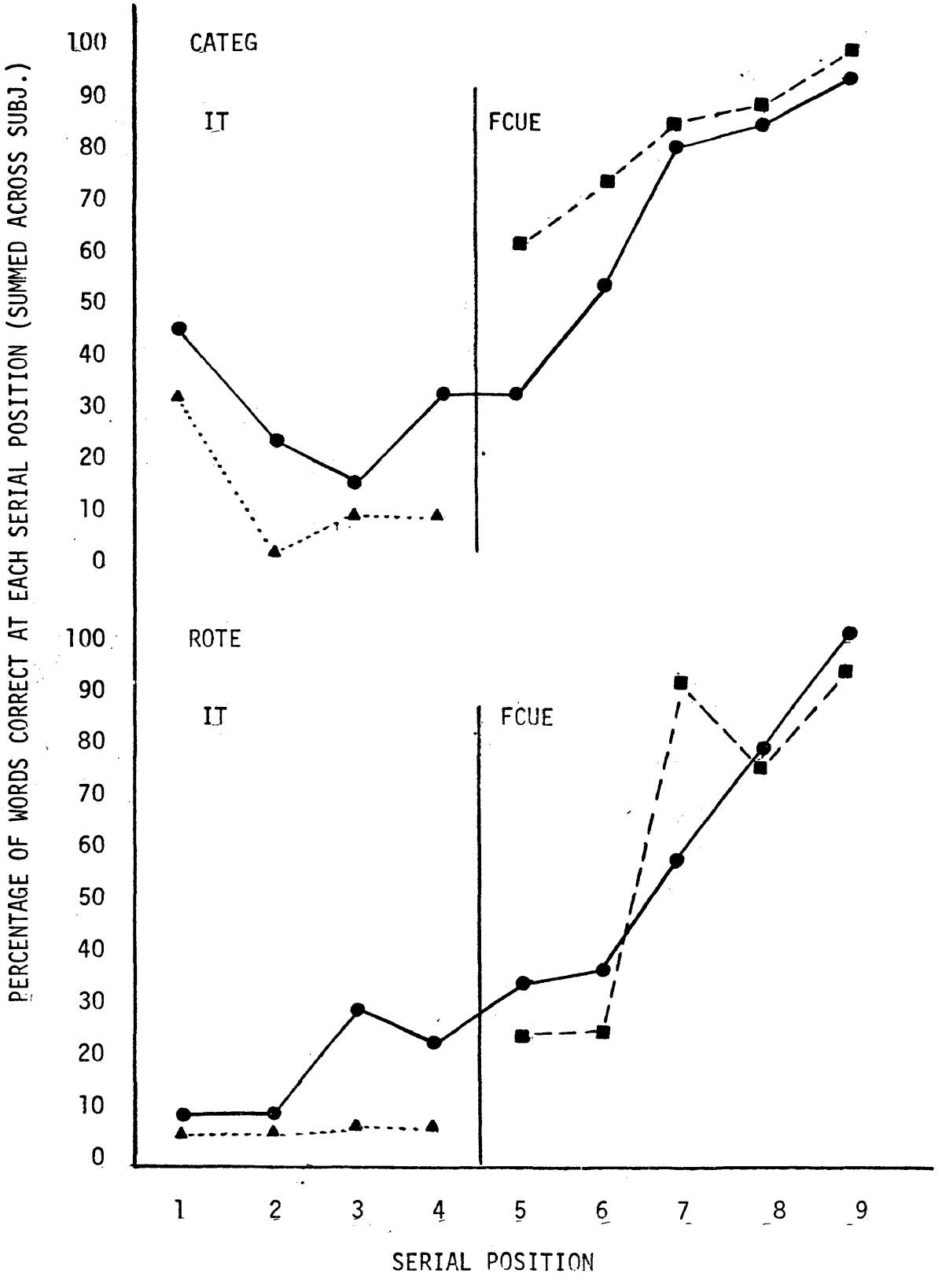
CATEG: CATEGORIZATION REHEARSAL CONDITION

ROTE: ROTE REHEARSAL CONDITION

IT: ILLEGAL TRIALS

FCUE: PLACEMENT OF THE FORGET INSTRUCTION




CATEG
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FCUE
ROTE
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FCUE
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PERCENTAGE OF WORDS CORRECT AT EACH SERIAL POSITION (SUMMED ACROSS SUBJ.)
SERIAL POSITION

($t(17)=3.17$, $p<.01$). These differences may be seen in Figures 1, 2, and 3 where the illegal trials are compared to corresponding positions on no FCUE lists, seperately by rehearsal condition and number of words before the FCUE.

It may be concluded, then, that words before a FCUE are not recalled as well as words in similar serial positions which are not followed by a FCUE. In the categorization condition it may be argued that subjects stopped rehearsing the words before the FCUE just as soon as they saw the FCUE while they did not stop rehearsing them when there was no FCUE. The explanation, then, for the above differences would be differential rehearsal of the words. This is Bjork's position. However, in the rote rehearsal condition all words were rehearsed in an identical fashion and the presence of a FCUE did not change the nature of rehearsal (saying each word out loud three times). Accordingly, differential rehearsal and/or categorization do not seem adequate explanations of the observed differences. The result here would be consistent with the dumping hypothesis; that is, that the subject can actively erase material from memory when he sees a FCUE. There is another possibility, discussed by Weiner & Reed (1969). They argue that there is a mechanism in memory which blocks access to stored material and that this mechanism, which is related to the phenomenon of clinical repression, is at work in intentional forgetting. The present data do not permit a choice between these two explanations.

When subjects were asked to guess how many illegal trials there were, the average guess was 3.5. Actually, there were 6 illegal trials. It would seem, then, that on at least half the illegal subjects did not respond differently than they did to the genuine trials.

There is another approach to intentional forgetting which may be called the attenuation of proactive interference. If a FCUE decreases proactive interference, then recall of items after such a FCUE should be better than recall of items in corresponding serial positions that were not preceded by such a FCUE. Studies which have confirmed this line of reasoning have been performed by Bjork et al., (1968), Shebilski et al., 1971) and Weiner & Reed (1969). Such an approach was applied to the results of experiment two. Figures 1, 2, and 3 present the percentages of items correct plotted against serial position.

The total number of errors was summed across the serial positions after the FCUE and again across the positions on the no FCUE lists corresponding to those after the FCUE. Summing was performed because of the few data points at each serial position. This was done three times; once for when the FCUE came after the second word, the third word and the fourth word of the list. Three analyses of variance were done on these sets of errors. Appendix G presents the data actually employed. A one between-subjects variable (rehearsal condition) and one-within subjects variable (FCUE

condition) type analysis was used. The rehearsal variable was included because if the FCUE variable was significant, then it would be confirmatory of Bjork's theoy if there were fewer errors in the categorization condition.

Table 13 shows the means for the main effect. Tables 14, 15, and 16 present a summary of the three analyses. There were no significant Fs for the FCUE conditions. Accordingly, it did not appear that the FCUE had any effect on proactive interference; it did not improve the recall of words after the FCUE. The significant Fs for the rehearsal conditions indicate that there were fewer errors for the categorization condition than for the rote condition. The isolated interaction seen in Table 14 is intersting and in the predicted direction. Its validity is highly questionable, however, since it was not replicated or even hinted at in the other two analyses.

Figures 1, 2, and 3 indicate that the word immediately following the FCUE is generally recalled much better than the items immediately preceding and following it. It is possible that this is an isolation effect and not particularly relevant to intentional forgetting. On the other hand, Bruce & Papay (1970) argue that this is a primacy effect produced by the FCUE. They argue that the FCUE creates a new list out of the TBR and that recall of the TBR is like that of a list with no FCUE; that is, that recall of the TBR shows a primacy and a recency effect.

TABLE 13

EXPERIMENT 2: MEAN PERCENTAGES OF TOTAL ERRORS FOR REHEARSAL CONDITION, FCUE CONDITION, AND NUMBER OF WORDS BEFORE THE FCUE

	2		3		4	
	ROTE	CATEG	ROTE	CATEG	ROTE	CATEG.
FCUE	4.2	2.7	2.8	2.3	2.0	1.1
NO FCUE	3.5	3.2	2.8	2.3	1.9	2.7

ROTE: ROTE REHEARSAL CONDITION

CATEG: CATEGORIZATION REHEARSAL CONDITION

2: FCUE CAME AFTER 2ND WORD

3: FCUE CAME AFTER 3RD WORD

4: FCUE CAME AFTER 4TH WORD

TABLE 14

EXPERIMENT 2: ANALYSIS OF VARIANCE FOR TOTAL ERRORS (FCUE AFTER 2ND WORD)

SOURCE	DF	MS	F
BETWEEN SUBJECTS	35		
A (REHEARSAL)	1	16.055	11.312 **
ERROR A	34	1.420	
WITHIN SUBJECTS	36		
B (FCUE)	1	0.340	0.36
AB	1	8.000	8.333 **
ERROR B	34	0.960	

**p<.01

TABLE 15

EXPERIMENT 2: ANALYSIS OF VARIANCE FOR TOTAL ERRORS (FCUE AFTER 3RD WORD)

SOURCE	DF	MS	F
BETWEEN SUBJECTS	35		
A (REHEARSAL)	1	4.253	5.22 *
ERROR A	34	0.815	
WITHIN SUBJECTS	36		
B (FCUE)	1	0.003	0.07
AB	1	0.087	0.168
ERROR B	34	0.516	

*p<.05

TABLE 16

EXPERIMENT 2: ANALYSIS OF VARIANCE FOR TOTAL ERRORS (FCUE AFTER 4TH WORD)

SOURCE	DF	MS	F
BETWEEN SUBJECTS	35		
A (REHEARSAL)	1	0.22	0.04
ERROR A	34	5.76	
WITHIN SUBJECTS	36		
B (FCUE)	1	10.89	2.27
AB	1	12.50	2.61
ERROR B	34	4.79	

CONCLUSION

The experiments reported here attempted to cover a wide range of conditions under which intentional forgetting might occur. Subjects were presented with both words and trigrams, the easy to categorize and the hard. They were given rehearsal instructions which permitted them to rehearse as they pleased, to rote memorize, to categorize or they were denied rehearsal time. One experiment required serial ordered recall and one used a probe technique. In some conditions subjects were specifically requested to erase the TBF from memory and in some conditions they were told only to remember the TBR. A concerted effort was made to find the necesary and sufficient conditions for and to test the generality of the phenomenon of intentional forgetting. However, none of these conditions or various combinations of them produced intentional forgetting.

The major difficulty was that there were so few instances of PII that a significant difference between the number of PII on a FCUE list and a no FCUE list was unobtainable. Whether intentional forgetting would have occurred if more PII had been present is undeterminable from the present data.

It is, of course, not possible on the basis of the two reported studies to confirm or disconfirm any theory to explain intentional forgetting. The only evidence is from the first study

when both PII and OM were used. The approach is, however, of questionable validity. There is some little support of Bjork's theory but the result with the illegal trials is more easily explicable in terms of the dumping hypothesis.

The major question, however, is why these two experiments failed to produce intentional forgetting in the form demonstrated by Bjork (1970), Turvey & Wittlinger (1969), and the others cited above. Quite possibly the answer lies in the stimulus materials. In the two experiments reported here, in order to improve their geeralizability, strings of words and trigrams were used. Subjects had to learn the items and to recall them. Each item was new to the subject. In Turvey & Wittlinger's (1969) study, strings of digits and one or two consonant quadragrams were used. Accordingly, subjects knew the whole set of items, the 2i consonants of the alphabet, before they saw the lists. The decreased and fully known response set meant that PII were more probable and, of course, it is necessary to obtain PII before intentional forgetting can occur. Accordingly, their study was working with quite an unexpected advantage over the present experiments in regard to the probability of obtaining intentional forgetting.

Bjork's study was very similar to experiment two. The major difference was that his subjects were given a paired associates task rather than just a list of words to memorize. It is very difficult to see why the results of the experiments were so very

different. Certainly it points to the possibility that intentional forgetting is obtainable under only very specific conditions. If this is true, then certainly the value of intentional forgetting to a general theory of human memory becomes questionable.

APPENDIX A

EXPERIMENT 1: THE STIMULUS MATERIALS

Experiment 1: The Stimulus Materials

List ----- FCUE

I	II	III	IV	V
CHIN 2+4	HERO 5+7	DIB 3+9	HARP 6+7	TEP 3+8
TREE 5+7	WARD 6+4	MOY 4+4	--------	FUG 4+8
DRAM 1+2	TOGA 8+2	GID 5+1	DOOM 2+6	HEF 6+6
LIFE 4+9	FACE 5+1	-------	LAMB 9+7	GOH 2+3
PILL 3+3	CRAB 3+7	NUD 2+8	WASP 8+7	POJ 7+6
FLAP 2+4	PART 4+1	TOH 4+6	SOOT 2+3	MOX 4+7
UNIT 8+6	MULE 6+1	ZIN 3+7	COAT 3+1	
	SLUM 3+5	PUZ 2+8		
		VOY 8+9		

VI	VII	VIII	IX	X
HAK 9+6	VOLT 5+4	ZEP 8+3	DUDE 3+9	YUS 6+7
SYD 3+5	ECHO 7+1	JOP 2+2	--------	LEK 6+4
ROK 7+4	CRIB 3+8	-------	TEAM 1+6	VUL 1+1
FAM 4+3	FOOD 5+2	BAF 4+5	MIST 3+8	DYS 4+2
-------	--------	HIB 4+7	HALL 6+7	NIF 3+5
KAB 5+6	BRAN 9+7	GOK 6+1	CORD 9+1	FOM 4+2
BER 1+6	TOMB 7+4	WUF 3+2	GRAM 8+8	WIR 6+1
WAF 9+5	LOBE 3+2	DOH 9+8		JOV 4+9
DER 7+7	SOFA 3+7			
JER 8+5	DIME 2+5			

XI	XII	XIII	XIV	XV
FOAL 3+7	CREW 3+9	LIG 6+1	BUNK 2+4	YAN 3+8
BACK 1+8	ROLE 8+4	MOK 6+3	ROOM 1+4	POF 4+5
CLAY 5+1	PAIL 3+4	CAG 7+2	ALLY 6+2	-------
--------	TRAM 1+7	HIX 7+4	FLAW 9+6	ZAP 5+3
TUNE 4+8	--------	KAC 9+3	LUTE 4+4	TAW 6+5
APEX 5+4	VEIL 5+4	GOF 6+5	ZEAL 7+8	CAK 2+3
SLAB 2+7	DUKE 9+1		SODA 3+9	NEF 9+8
JADE 7+6	EDGE 2+5			JOR 2+5
NECK 5+2	SALT 8+1			
	WREN 9+7			

XVI	XVII	XVIII	XIX	XX
WIFE 8+2	MONK 1+8	NIS 8+7	HEMP 3+9	FUT 5+1
DEER 9+4	CENT 2+8	PAF 6+3	ZERO 2+6	-------
VEST 7+7	STAG 6+5	FOZ 4+9	LORE 9+1	PEB 7+4
TRIP 6+9	BARD 2+9	-------	ACRE 6+1	VES 7+5
LUCK 3+4	DUCT 7+7	LUB 4+8	SHOP 5+8	LIX 6+9
POEM 1+4	ARMY 5+4	VIB 8+6	GLUE 6+4	JIT 8+2
CHEF 8+7	RUST 2+4	TOX 7+6	DUSK 3+7	HEG 1+2
GERM 7+6		HOD 7+9	TANG 6+5	
		YAL 5+8	PEAR 3+1	

XXI	XXII	XXIII	XXIV	XXV
KUN 4+5	OPAL 7+8	FIC 3+7	CEW 4+1	CLUE 5+5
MAV 1+4	ZONE 6+6	ZIN 1+8	KUL 1+4	GANG 6+8
SOF 4+7	KNOB 2+1	HUK 3+6	TOZ 7+1	--------
WOS 9+1	SOAP 2+3	-------	VOK 3+1	MAID 3+7
JAD 4+3	--------	NUD 6+3	DUT 8+5	ITEM 4+4
CEK 2+5	CAPE 4+3	GID 7+8	BIX 9+9	ATOM 6+3
	IRIS 4+9	MOY 1+6	PEZ 3+4	SERF 8+3
	MENU 6+7	DIB 9+6	LAZ 5+6	BOAT 8+1
	DUNE 2+7	JOV 2+2	RUP 7+2	
	YEAR 5+8			

XXVI	XXVII	XXVIII	XXIX	XXX
LEB 3+5	HOLE 9+2	GUP 3+2	SUL 2+1	LOZ 5+7
FAH 1+4	YARD 4+7	LUZ 8+7	-------	FUB 2+7
JIR 8+7	MOSS 2+6	RYN 3+3	GUK 8+9	YOK 8+4
DAC 9+6	VAMP 9+8	JUK 7+3	RIX 5+5	VEP 5+6
RIS 6+2	BEEF 6+8	MOF 9+5	HIY 6+1	-------
TAY 8+5	SLOT 5+1	CIB 1+4	NUR 4+9	MEY 7+6
GUD 6+5		WOV 6+2	JAV 3+2	KES 3+8
BEF 8+8				PIM 4+3
				ROF 4+5
				BIK 7+8

XXXI	XXXII	XXXIII	XXXIV	XXXV
DORY 8+8	GIBE 6+2	RUC 8+6	FATE 5+2	BULK 1+2
SASH 2+5	BULB 5+5	LER 1+1	SPAN 6+3	LAKE 4+2
WOMB 8+1	FLAX 9+8	-------	USER 9+9	ACID 5+7
KITE 9+9	DUET 6+3	GOZ 6+7	COMA 8+5	--------
RATE 3+4	VASE 4+9	VIX 7+1	LUNG 7+4	RAIL 4+4
BEER 8+4	HAIR 2+8	MEK 6+7	DUTY 5+8	OMEN 6+9
LILY 2+7	TANK 7+5	SIZ 8+9		DEBT 2+3
PIKE 6+1	INCH 4+9	NID 4+3		NOUN 4+8
	JUNK 3+7			ZINC 5+9

XXXVI	XXXVII	XXXVIII	XXXIX	XL
EPIC 8+9	SAZ 1+7	ITCH 7+8	PEM 7+7	GUST 7+2
TUBE 4+1	LYF 5+3	EVIL 5+1	HET 9+2	--------
--------	DEG 3+8	GIRL 6+3	VAY 1+8	BANK 8+4
MEAL 7+6	GUR 9+5	COAT 8+9	JOW 2+4	HYMN 3+9
LION 3+9	BIM 4+4	--------	MIP 7+4	MILL 8+6
FERN 3+3	HUZ 6+2	HARP 6+5	NEG 4+6	ARCH 3+3
HOOP 5+4	CEY 6+5	BIRD 6+9	DAP 3+5	TALC 5+5
BRAT 8+8		JOLT 9+7	TYK 1+6	
		TOAD 6+1		
		FORT 2+3		

APPENDEX B

EXPERIMENT 1: THE NUMBER OF PII ERRORS BY SUBJECT FOR EACH CONDITION OF LIST LENGTH, REHEARSAL, INSTRUCTIONS, AND INFORMATION LOAD

Experiment 1: The Number of PII Errors by Subject for Each Condition of List Length, Rehearsal, Instructions, and Information Load

Legend

6: Lists with Six Items	W: Words Lists
7: Lists with Seven Items	T: Trigrams Lists
8: Lists with Eight Items	Active Erasal: Instructions to Erase TBF
9: Lists with Nine Items	Remember Only: Instructions to Remember Only the TBR

REHEARSAL ACTIVE ERASAL

SUBJECTS	FORGET CUE LISTS										NO FORGET CUE LISTS									
	6		7		8		9				6		7		8		9			
	W	T	W	T	W	T	W	T	ΣW	ΣT	W	T	W	T	W	T	W	T	ΣW	ΣT
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	2	0
3	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	1	1
4	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	1	1
5	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	2	1	2	1
6	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	2	0	3	0
7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	2	0	3	0
8	0	0	0	0	0	0	2	0	2	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	1	0	0	0	1	0	0	0	0	0	1	0	0	0	1	0
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0
Σ	0		0		2		2		3	1	2		1		4		11		15	3

REHEARSAL REMEMBER ONLY

FORGET CUE LISTS NO FORGET CUE LISTS

SUBJECTS	6		7		8		9				6		7		8		9			
	W	T	W	T	W	T	W	T	ΣW	ΣT	W	T	W	T	W	T	W	T	ΣW	ΣT
11	0	0	0	0	0	0	1	0	1	0	1	1	0	0	0	0	0	1	2	1
12	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0
15	0	0	1	1	0	0	0	1	1	2	0	0	0	0	0	0	0	1	0	1
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
17	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
19	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1	0	3	0	4	0
20	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0
Σ	0		2		2		3		5	2	3		0		4		5		8	4

NO REHEARSAL ACTIVE ERASAL

SUBJECTS	FORGET CUE LISTS										NO FORGET CUE LISTS									
	6		7		8		9				6		7		8		9			
	W	T	W	T	W	T	W	T	ΣW	ΣT	W	T	W	T	W	T	W	T	ΣW	ΣT
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
22	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	1	0	1	0
23	1	0	0	0	0	0	2	0	3	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	1	1	0	0	1	1	1	0	0	0	1	1	1	0	3	1
25	0	0	0	0	2	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0
26	0	0	1	0	0	1	1	1	2	2	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0
28	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	1	0
Σ	2		1		6		5		11	3	1		1		3		3		7	1

NO REHEARSAL REMEMBER ONLY

SUBJECTS	FORGET CUE LISTS										NO FORGET CUE LISTS									
	6		7		8		9				6		7		8		9			
	W	T	W	T	W	T	W	T	ΣW	ΣT	W	T	W	T	W	T	W	T	ΣW	ΣT
31	1	0	0	0	2	0	1	0	4	0	0	0	1	0	1	0	0	0	2	0
32	0	0	1	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	1	0
33	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0
34	0	0	0	0	0	0	2	0	2	0	0	0	1	0	1	0	1	0	3	0
35	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
36	0	0	1	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	1	0
37	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	1	0	3	0
38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39	0	0	0	0	0	0	1	0	1	0	0	0	1	0	0	0	0	0	1	0
40	1	0	0	0	0	0	1	0	2	0	0	0	0	0	0	0	0	0	0	0
Σ	2		3		2		5		12	0	1		6		3		2		12	0

APPENDIX C

EXPERIMENT 1: MEAN PERCENTAGE OF PII ERRORS AND OF PII + OM ERRORS BY SUBJECTS, REHEARSAL CONDITION, INSTRUCTIONS, AND FORGET CUE CONDITION

Experiment 1: Mean Percentage of PII Errors and of PII + OM Errors by Subjects, Rehearsal Condition, Instructions, and Forget Cue Condition

NFCUE: No Forget Cue Lists
FCUE: Forget Cue Lists
W: Words Lists
T: Trigrams Lists

Active Erasal: Instructions to Erase TBF
Remember Only: Instructions to Remember TBR

SUBJECTS	PII				PII + OM			
	REHEARSAL / ACTIVE ERASAL							
	FCUE		NFCUE		FCUE		NFCUE	
	W	T	W	T	W	T	W	T
1	0	0	5.6	0	0	20.0	61.1	33.3
2	0	0	16.6	0	33.3	19.0	75.0	78.6
3	0	0	11.1	4.0	44.4	38.1	55.6	36.0
4	0	0	7.1	3.8	16.7	40.9	85.7	69.2
5	0	3.2	9.1	3.0	44.4	22.6	50.0	39.4
6	0	0	11.1	0	71.4	39.1	88.9	60.7
7	0	0	12.0	0	50.0	35.3	60.1	48.3
8	28.6	0	0	0	71.4	28.6	80.9	46.4
9	8.3	0	5.6	0	50.0	18.2	66.7	62.1
10	0	0	7.1	0	33.3	25.0	64.3	55.6
$\bar{X}$	3.7	0.3	8.5	1.1	41.5	28.7	68.8	52.9
	REHEARSAL / REMEMBER ONLY							
11	5.6	0	5.3	6.5	50.0	51.8	52.6	70.1
12	16.7	0	0	0	50.0	0	0	8.0
13	0	0	0	0	12.5	31.3	66.6	54.5
14	0	0	6.3	0	0	28.3	93.8	41.4
15	9.1	7.7	0	3.1	18.2	23.1	66.6	21.9
16	0	0	0	4.5	0	28.6	94.4	63.6
17	20.0	0	0	0	20.0	36.4	75.0	41.9
18	0	0	0	3.1	20.0	51.8	80.0	69.7
19	0	2.9	12.9	0	16.7	23.5	51.6	43.3
20	0	0	11.1	0	0	43.8	44.4	50.0
$\bar{X}$	5.1	1.1	3.6	1.7	18.7	31.4	62.5	46.4

SUBJECTS	PII				PII + OM			
	NO REHEARSAL / ACTIVE ERASAL							
	FCUE		NFCUE		FCUE		NFCUE	
	W	T	W	T	W	T	W	T
21	0	0	3.3	0	82.7	86.7	93.3	85.3
22	4.0	0	4.2	0	80.0	96.3	83.3	82.9
23	13.6	0	0	0	59.1	64.5	68.0	71.4
24	7.7	4.8	13.6	4.0	76.9	71.4	81.8	76.0
25	7.1	0	0	0	50.0	70.9	79.3	75.8
26	8.3	7.4	0	0	75.0	74.1	82.1	82.1
27	0	0	3.2	0	77.0	81.8	83.9	78.8
28	3.8	0	0	0	80.8	82.1	75.0	69.7
29	0	0	0	0	87.5	75.8	92.3	89.7
30	3.5	0	3.3	0	82.8	75.0	83.3	83.9
$\bar{X}$	4.8	1.2	2.76	0.4	75.2	77.8	82.2	79.6
	NO REHEARSAL / REMEMBER ONLY							
31	13.8	0	8.7	0	72.4	75.0	69.6	78.8
32	3.9	0	4.0	0	69.2	82.1	64.0	86.7
33	0	0	5.0	0	100.0	61.5	75.0	61.8
34	7.4	0	10.7	0	62.9	61.5	78.6	83.9
35	4.6	0	0	0	77.3	86.7	95.8	82.4
36	3.7	0	3.1	0	70.4	72.7	84.4	63.9
37	0	0	9.7	0	71.4	69.7	70.9	75.0
38	0	0	0	0	86.4	96.4	76.9	93.1
39	3.6	0	3.6	0	85.7	75.7	85.7	83.9
40	6.7	0	0	0	70.0	86.7	86.7	81.3
$\bar{X}$	4.4	0	4.5	0	76.6	76.8	78.7	79.1

APPENDIX D

EXPERIMENT 1: MEAN NUMBER OF TOTAL ERRORS BY REHEARSAL CONDITION, INSTRUCTIONS, INFORMATION LOAD, AND FORGET CUE CONDITION

Experiment 1: Mean Number of Total Errors by Rehearsal Condition, Instructions, Information Load, and Forget Cue Condition

NFCUE: No Forget Cue Lists
FCUE: Forget Cue Lists
W: Words Lists
T: Trigrams Lists

ACTIVE ERASAL: Instructions to Erase TBF
REMEMBER ONLY: Instructions to Remember TBR

		FCUE		NFCUE	
		W	T	W	T
REHEARSAL	ACTIVE ERASAL	7.5	22.5	18.0	28.0
	REMEMBER ONLY	6.6	24.6	17.9	27.5
NO REHEARSAL	ACTIVE ERASAL	24.6	29.7	27.6	30.9
	REMEMBER ONLY	24.8	30.3	26.7	32.2

APPENDIX E

EXPERIMENT 2: THE STIMULUS MATERIALS

Experiment 2: The Stimulus Materials

List

----- FCUE *TARGET

I	II	III	IV	V	VI
WIT	ARK	SKY	FOX	VAN	GUT
URN	ZOO	FIN	ART	DOG	YAM
BAY	BOG	---	RYE	LOT	DEN
GEM	HOG*	ELM*	OIL	BUN	ION
TIN	FUN	MUG	KEG*	---	SIN
MOB	WAR	PEA	EAR	JIB	BAT
ELK*	DEW	AIR	JAW	TOP	RIM
ICE	LIP	WIG	IMP	WAD	LAD
CUE	OWL	BOX	LID	ACE	NET
		VAT		GAP	

VII	VIII	IX	X	XI	XII
TEA	FOG	WISP	CHIN	BONE	PIPE
POD	ORB	LOFT	HOLE	KNOT	SPAN
BIN	---	----	DRAM	CASE	HELM
---	ASH	CRAG*	SLOT	----	----
KID	HIP*	HEIR	YARD*	MILE	DUTY
IVY	PIE	BEAN	TREE	SLIT	MINK
RAT*	MOP	SOUP	FLAP	GOWN	FATE*
WAX	TAB	DAWN	VAMP	AIDE*	LUNG
NUN	CUP	FOOL	BEEF	PALM	GARB
OAK	ROE	GOAT		DOSE	USER

XIII	XIV	XV	XVI	XVII	XVIII
TEAM	MIST	JAIL	BARD	NAVY	WART
GRAM	TRAP	MOLE	TOWN	BRAT	VEAL
RAFT	SUIT*	SWAN	----	EPIC	----
DUDE	NODE	TART	PUMA	MEAL	RACK
----	LIFE	WORD	MOOR	SODA	BABY
BATH	KISS	FACT	LIMB	YARN*	TASK*
SICK	GUST	HALL	HAND	HOOP	DOLL
LARK	PILL	FLEA*	SASH	TUBE	LAND
CORD*	BROW	COMA	CENT	COAL	MOSS
PAIR			FUSE*		AXLE

XIX	XX	XXI	XXII	XXIII	XXIV
CALF	ALLY*	FERN	WAIF	ROOM	PULP
PAWN	OBOE	ARMY	MEAT	GUST	FOOT
TWIG	WARD	ISLE	DUEL	ZEAL	ITEM
ROAD	BUNK	STAG	GENT	----	YOKE*
----	PANG	GULF	FURY	MIEN*	RIND
OATH	TENT	DUCT	HAZE	DESK	TERM
FOIL	DOOR	CAKE*	BEET	LUTE	SERF
DECK*	FLAW	LION	AREA	HOST	DEED
SNOB	CAMP	RUBY	SHOE*	BOAT	GANG
LINE				ATOM	

XXV	XXVI	XXVII	XXVIII	XXIX	XXX
CLUE*	TUNE	HOBO*	NOUN	VEST	DORY
HOOF	LILT	SKIN	HERO	HULK	CELL
IDEA	SLAB	PAGE	DEBT	ARCH	MOOD
PLUM	GIFT	----	SLUM	WIFE	----
CART	----	WELT	WARD	CHEF	TONE
FOAL	BACK	FIST	TOGA	MESH*	KITE
WOLF	DOVE	DIRT	MULE*	TRIP	SAND
APEX	NECK	LOON	ACID	SIDE	OVEN
MAID	MINT	BEAD	FACE	DEER	PIKE*
	RASH*	CAST			IRON

XXXI	XXXII	XXXIII	XXXIV	XXXV	XXXVI
ECHO	RIFT*	RAIL	WOMB	LILY	CAPE
LOBE	MOTH	OMEN*	DIME	BEER	YEAR
YOLK	PEEL	PART	POEM	----	HERB
TOMB	GOAL	----	----	JAZZ	LACE
BRAN	----	JURY	FLAG	FOOD	PATH
RIOT	NOON	BULK	LUCK*	CRIB	ZONE
GATE	LAKE	HOME	RAMP	RANK	NOOK*
NOSE*	AUNT	ZINC	VICE	VOLT	OPAL
SOFA	VEIN	FANG	GERM	MANE*	IRIS
	JADE	CRAB	BOND	PAIN	

XXXVII	XXXVIII	XXXIX	XL	XLI	XLII	XLIII
FLAX	PEST	FORK	ROAN	ZERO	DUNE	INCH
WINE	REED	NAVE	HARP	FISH*	WIRE	CORN
GIBE*	AURA	ALTO	BEAR	----	----	ZEST
KEEL	MILK*	CREW	TOAD	LORE	KNOB	----
POET	HEEL	----	DOOM*	BIAS	MENU	MAZE
EARL	CITY	PAIL	PACT	COLT	TIDE	JUNK
DUET	LANE	HILL*	KING	SHOP	SOAP*	HAIR
SOUL	QUAY	LAMP	NEST	HEMP	BELL	TANK
BULB	FOAM	TRAM	SOOT	DUSK	GAME	VASE
		DUKE		NOTE	FIFE	RICE*

XLIV	XLV	XLVI	XLVII	XLVIII	XLIX	L
BELT	ROLE*	LAMB	PEAR	FROG	MONK	HYMN
DISH*	VEIL	MOON*	WREN	GIST	DIAL	VERB*
TOOL	----	JOLT	KNEE	NEWS	----	CLAN
SIGN	MOAT	WASP	OPUS	BIRD	TINT	MILL
NAPE	ACRE	----	MAIL	----	JOKE*	BANK
VINE	GASH	FORT	UNIT	PEER*	LYNX	ROOF
JOWL	EDGE	ITCH	TANG	CLAY	SIZE	ACHE
KILT	SALT	GIRL	ROSE	MALT	GONG	PEER
WEEK	KILN	EVIL	GLUE*	HARM	ODOR	TALC
	BOAR	COAT		SLOP	RATE	

APPENDIX F

EXPERIMENT 2: THE RAW DATA

1. THE CORRECT AND INCORRECT

2. PII AND OM ERRORS

3. TOTAL ERRORS

4. PII + OM AS A PERCENTAGE OF TOTAL ERRORS

5. THE CORRECT AND INCORRECT ON THE ILLEGAL TRIALS

Experiment 2: The Raw Data

1. The Correct and Incorrect
2. PII and OM Errors
3. Total Errors
4. PII + OM as a Percentage of Total Errors
5. The Correct and Incorrect on the Illegal Trials

Legend

Ln: Lists with n Number of Words Before FCUE

3,4,...9: Serial Positions for Lists with FCUE

1,2,...9: Serial Positions for Lists with no FCUE

1,2,...4: Serial Positions for Illegal Trials

ΣPII and ΣOM: PII and OM Errors Summed Across Serial Position

TE: Total Errors

C: Correct Responses

X: Incorrect Response

P: PII Error

O: OM Error

PII+OM: PII Errors Plus OM Errors as a Percentage of Total Errors

SUBJECTS		CATEGORIZATION FORGET CUE LISTS											CATEGORIZATION NO FORGET CUE LISTS											ILLEGAL TRIALS			
		3	4	5	6	7	8	9	ΣPII	ΣOM	TE	PII+OM	1	2	3	4	5	6	7	8	9	ΣPII	ΣOM	TE	PII+OM	1	2	3	4
1	L2	P	X	X	C	C	X	X	1	0	5	20%	C	X	X	X	C	X	C	C	C	3	0	12	25%	X	C		
	L3	-	C	X	X	X	X	C	0	0	4	0%	X	X	X	X	P	P	X	P	C					X	X		
	L4	-	-	P	C	C	C	C	1	0	1	100%																X	X
2	L2	C	C	C	C	C	C	C	0	0	0	0%	C	X	X	X	X	X	C	X	C	0	0	11	0%	X	X		
	L3	-	X	X	C	C	C	C	0	0	2	0%	X	X	X	X	C	C	C	X	C						X	X	
	L4	-	-	C	C	C	C	C	0	0	0	0%														X	X		
3	L2	C	X	P	C	C	X	C	1	0	3	33%	C	X	X	C	C	C	P	C	C	2	0	8	25%	X	X		
	L3	-	C	X	C	C	X	C	0	0	2	0%	X	X	X	C	C	P	P	C	C					X		X	
	L4	-	-	C	C	X	C	C	0	0	1	0%																C	X
4	L2	C	X	C	C	C	C	C	0	0	1	0%	C	X	X	X	X	X	C	X	C	0	0	11	0%	X	X		
	L3	-	C	C	C	X	C	C	0	0	1	0%	X	X	X	C	C	X	C	C	C						C	X	
	L4	-	-	C	C	C	C	C	0	0	0	0%																X	X
5	L2	X	X	C	C	C	X	C	0	0	3	0%	X	C	X	X	X	C	C	C	C	1	0	8	12%	X	X		
	L3	-	X	C	C	X	C	C	0	0	2	0%	C	C	X	C	P	X	C	C	X					C	X		
	L4	-	-	P	C	C	C	C	1	0	1	100%																X	C
6	L2	C	X	P	C	C	X	C	1	0	3	33%	C	C	0	0	X	C	C	C	C	0	3	7	43%	X	X		
	L3	-	C	X	X	X	X	C	0	0	4	0%	0	X	X	C	C	C	X	C	C						X	X	
	L4	-	-	X	X	C	C	C	0	0	2	0%														X	X		
7	L2	C	X	C	X	C	X	X	0	0	4	0%	C	X	X	X	C	X	C	P	C	1	1	9	22%	X	X		
	L3	-	C	X	C	X	X	X	0	0	4	0%	0	X	C	C	C	X	C	X	C					C	X		
	L4	-	-	C	C	C	X	C	0	0	1	0%														X	X		
8	L2	C	C	C	C	X	C	X	0	0	2	0%	C	0	X	X	X	P	0	C	C	1	5	12	42%	X	X		
	L3	-	C	X	C	X	C	C	0	0	2	0%	X	0	X	C	0	0	C	C	C					X		X	
	L4	-	-	C	C	X	C	C	0	0	1	0%														X	X		
9	L2	C	0	X	C	C	X	C	0	1	3	33%	C	X	X	X	X	X	C	C	C	0	0	10	0%	X	X		
	L3	-	C	X	C	C	C	C	0	0	1	0%	X	X	X	X	X	C	C	C	C					C	C		
	L4	-	-	C	X	C	C	C	0	0	1	0%																X	X

CATEGORIZATION

SUBJECTS		FORGET CUE LISTS										NO FORGET CUE LISTS												ILLEGAL TRIALS			
		3	4	5	6	7	8	9	ΣPII	ΣOM	TE	PII+OM	1	2	3	4	5	6	7	8	9	ΣPII	ΣOM	TE	PII+OM	1	2	3	4
10	L2	C	X	C	C	C	C	C	0	0	1	0%	C	X	C	X	C	P	C	0	C	1	3	10	40%	X	X		
	L3	-	C	0	C	P	C	C	1	1	2	100%	0	X	0	X	X	C	X	C	C					C		X	
	L4	-	-	0	X	0	C	C	0	2	3	66%															X		X
11	L2	X	C	C	C	C	X	C	0	0	2	0%	C	X	P	X	X	C	X	C	C	1	0	10	10%	X	X		
	L3	-	X	X	C	X	C	C	0	0	2	0%	X	X	X	X	C	C	X	C	C							C	X
	L4	-	-	C	C	C	X	C	0	0	1	0%																X	X
12	L2	C	C	X	C	X	C	C	0	0	2	0%	C	C	X	X	X	C	C	C	C	0	0	6	0%	X	X		
	L3	-	C	C	X	C	C	C	0	0	1	0%	X	X	X	C	C	C	C	C	C						X	X	
	L4	-	-	C	C	C	C	C	0	0	0	0%																X	X
13	L2	C	X	X	C	C	C	C	0	0	2	0%	C	C	X	C	X	X	C	C	X	2	0	10	20%	X	X		
	L3	-	C	C	C	X	C	X	0	0	2	0%	X	X	P	X	X	P	C	C	C					X		X	
	L4	-	-	X	C	C	C	C	0	0	1	0%																X	X
14	L2	X	X	C	C	C	X	C	0	0	3	0%	C	C	0	C	P	C	C	C	C	4	1	9	55%	C	X		
	L3	-	C	X	X	C	C	C	0	0	2	0%	X	C	P	P	P	X	C	X	C					X		X	
	L4	-	-	C	C	C	C	C	0	0	0	0%																X	X
15	L2	C	X	X	C	C	X	C	0	0	3	0%	C	C	X	X	X	C	X	C	C	1	1	7	28%	X	X		
	L3	-	C	X	X	X	C	C	0	0	3	0%	C	0	P	C	X	C	C	C	C					C	X		
	L4	-	-	C	X	C	C	C	0	0	1	0%														C	X		
16	L2	X	X	P	C	0	X	C	1	1	5	40%	C	X	C	X	C	C	C	X	C	0	0	8	0%	X	X		
	L3	-	C	X	X	C	C	C	0	0	2	0%	X	X	C	X	X	X	C	C	C					X	X		
17	L2	0	0	X	X	C	X	C	0	2	5	40%	X	0	0	X	X	X	0	C	C	0	5	12	42%	X	X		
	L3	-	C	0	C	0	C	X	0	2	3	66%	X	X	X	0	0	C	C	C	C					X		X	
	L4	-	-	C	X	X	C	C	0	0	2	0%														X	X		
18	L2	C	X	C	C	C	C	C	0	0	1	0%	X	X	C	C	X	C	C	C	C	0	0	5	0%	X	X		
	L3	-	X	X	C	C	C	C	0	0	2	0%	C	X	C	X	C	C	C	C	C					X	X		
	L4	-	-	X	C	C	C	C	0	0	1	0%														X	X		

ROTE

SUBJECT		FORGET CUE LISTS										NO FORGET CUE LISTS												ILLEGAL TRIALS			
		3	4	5	6	7	8	9	ΣPII	ΣOM	TE	PII+OM	1	2	3	4	5	6	7	8	9	ΣPII	ΣOM	TE	PII+OM	1	2	3	4
19	L2	C	C	X	X	X	C	C	0	0	3	0%	X	X	X	P	X	X	C	C	C	1	0	10	10%	C	X		
	L3	-	P	X	C	C	C	C	1	0	2	50%	X	X	C	X	X	C	C	C	C					X		X	
	L4	-	-	X	C	C	C	C	0	0	1	0%														X	X		
20	L2	X	X	X	X	X	X	C	0	0	6	0%	X	X	X	X	X	X	C	C	C	0	0	11	0%	X	X		
	L3	-	P	X	C	X	X	X	1	0	4	25%	X	X	C	X	X	C	X	C	C					X		X	
	L4	-	-	X	P	C	X	C	1	0	3	33%															X		X
21	L2	C	X	0	X	C	C	C	0	1	3	33%	X	X	X	0	P	X	X	C	C	2	2	12	33%	X	C		
	L3	-	C	X	C	X	C	C	0	0	2	0%	X	X	C	X	P	C	0	C	C					X	X		
	L4	-	-	X	P	X	C	C	1	0	3	33%														X	C		
22	L2	0	X	X	C	C	C	C	0	1	3	33%	X	X	X	C	C	P	0	C	C	2	1	8	37%	X	X		
	L3	-	P	P	0	C	C	C	2	1	3	100%	C	X	C	C	C	C	X	P	C					C	X		
	L4	-	-	X	P	C	C	C	1	0	2	50%														C	X		
23	L2	C	X	C	C	X	C	C	0	0	3	0%	X	X	X	X	X	P	C	C	C	3	0	11	27%	X	C		
	L3	-	X	X	X	0	C	C	0	1	4	25%	X	X	C	P	P	X	C	C	C					X	X		
	L4	-	-	X	X	C	C	C	0	0	2	0%																X	X
24	L2	X	X	X	0	0	C	C	0	2	5	40%	X	X	X	X	X	P	X	0	C	1	1	12	17%	X	X		
	L3	-	0	P	X	X	C	C	1	1	4	50%	X	X	X	C	C	0	C	C	C					X	X		
	L4	-	-	C	C	C	C	C	0	0	0	0%														X	X		
25	L2	C	X	X	X	C	X	C	0	0	4	0%	X	0	X	X	C	C	C	C	C	0	2	9	22%	X	X		
	L3	-	C	0	X	0	C	C	0	2	3	66%	X	0	C	X	X	C	C	X	C					X		X	
	L4	-	-	0	0	C	C	C	0	2	2	100%																X	X
26	L2	X	X	X	X	X	X	C	0	0	6	0%	C	X	P	P	C	0	C	C	C	2	1	12	25%	X	X		
	L3	-	P	0	X	X	C	C	1	1	4	50%	X	X	X	X	X	X	X	X	C						X	X	
	L4	-	-	X	P	C	C	X	1	0	3	33%																X	C
27	L2	C	X	0	0	C	C	C	0	2	3	66%	X	X	X	X	X	X	X	C	C	0	1	10	10%	X	X		
	L3	-	C	0	C	X	C	C	0	1	2	50%	X	X	C	C	C	0	C	C	C					X		X	
	L4	-	-	X	X	C	C	C	0	0	2	0%														X	X		

ROTE

SUBJECTS		FORGET CUE LISTS 3 4 5 6 7 8 9	ΣPII	ΣOM	TE	PII+OM	NO FORGET CUE LISTS 1 2 3 4 5 6 7 8 9	ΣPII	ΣOM	TE	PII+OM	ILLEGAL TRIALS 1 2 3 4
28	L2	X X X X O X C	0	1	6	16%	O X X X X X P C C	1	4	13	31%	X X
	L3	- O X P O C C	1	2	4	75%	X X O C O O C X C					C X
	L4	- - X X C C C	0	0	2	0%						X X
29	L2	C X X X X C C	0	0	4	0%	X X O X P C C C C	3	2	11	45%	X X
	L3	- X X C C C C	0	0	2	0%	X X X P P O C C C					X X
	L4	- - X X X X C	0	0	4	0%						X X
30	L2	C X X X X C C	0	0	4	0%	X X X X X O X C C	3	1	12	33%	X X
	L3	- C X X C C C	0	0	2	0%	X X P P C P C C C					X X
	L4	- - C P C C C	1	0	1	100%						X X
31	L2	X O X O C X C	0	2	5	40%	X X C X C X C C C	0	0	8	0%	C X
	L3	- P O C C C C	1	1	2	100%	X C X X X C C C C					X X
	L4	- - P P C X C	2	0	3	66%						X C
32	L2	P X X X C C C	1	0	4	25%	C X X C C C X X C	0	1	10	10%	X X
	L3	- X C X O C C	0	1	3	33%	X X X X O C X C C					X X
	L4	- - P C C X C	1	0	2	50%						X X
33	L2	X X X X X X C	0	0	6	0%	X X X X C X C C C	0	0	9	0%	X X
	L3	- P X C X C C	1	0	3	33%	X X X X C C C C C					X X
	L4	- - P X C C C	1	0	2	50%						X X
34	L2	O X X C C X C	0	1	4	25%	X C X O X X C C C	0	2	12	16%	X X
	L3	- O X C C C C	0	1	2	50%	X C O X X X X X C					X X
	L4	- - O X C C C	0	1	2	50%						X X
35	L2	X X X P C C C	1	0	4	25%	O X X C X X C C C	1	4	11	45%	X X
	L3	- C O P X C C	1	1	3	66%	O X C P O O O C C					C X
	L4	- - C C X C C	0	0	1	0%						X X
36	L2	O X O O C C C	0	3	4	75%	O X X C P C P C C	3	2	10	50%	X X
	L3	- O X C C C C	0	1	2	50%	X X C X P O C C C					X X
	L4	- - C P C C C	1	0	1	100%						X X

APPENDIX G

EXPERIMENT 2: TOTAL ERRORS BY SUBJECT, REHEARSAL CONDITION, FORGET CUE, AND NUMBER OF WORDS BEFORE THE FORGET CUE

Experiment 2: Total Errors by Subject, Rehearsal Conditions, Forget Cue, and Number of Words Before the Forget Cue

Legend

Categorization: Categorization Instructions

Rote: Rote Instructions

NF: No Forget Cue Lists

L2: Forget Cue Followed 2nd Word

L3: Forget Cue Followed 3rd Word

L4: Forget Cue Followed 4th Word

Scores for NF have been halved to make scores comparable to those of the Forget Cue Lists

L2: Highest possible score is 7

L3: Highest possible score is 6

L4: Highest possible score is 5

CATEGORIZATION		L2	NL	L3	NL	L4	NL
SUBJECT	1	5	4.5	4	3.5	1	2.5
	2	0	4	2	3	0	2
	3	3	2.5	2	1.5	1	1.5
	4	1	2.5	1	1.5	0	1.5
	5	3	2.5	4	1.5	2	1
	6	4	3	4	2.5	1	2
	7	2	4	2	3	1	2.5
	8	3	3.5	1	2.5	1	1.5
	9	1	3.5	2	3	3	2
	10	2	3.5	2	2	1	1.5
	11	2	2	1	1	0	0.5
	12	2	4	2	3	1	2.5
	13	3	4	2	3	0	2
	14	3	3	3	2	1	1.5
	15	5	2.5	2	2.5	2	1.5
	16	5	4	3	3	2	2
	17	3	3.5	2	2.5	1	1.5
	18	1	1	2	1	1	0.5
ROTE	19	3	3	2	2.5	1	1.5
	20	6	3.5	4	3	3	2
	21	3	4	2	3.5	3	2.5
	22	3	2.5	3	2	2	2
	23	3	3.5	4	3	2	2
	24	5	4	4	3	0	2.5
	25	4	2.5	3	2	2	1
	26	6	4.5	4	3.5	3	2.5
	27	3	3	2	2.5	2	2
	28	6	4.5	4	3.5	2	3
	29	4	3.5	2	2.5	4	1.5
	30	4	4	2	3	1	1.5
	31	5	2.5	2	2	3	1
	32	4	3.5	3	2.5	2	2
	33	6	2.5	3	1.5	2	0.5
	34	4	5	2	4	2	3
	35	4	3.5	3	3	1	2.5
	36	4	3	2	2.5	1	2

REFERENCES

Archer, E. J. Re-evaluation of the meaningfulness of all possible CVC trigrams. Psychological Monographs, 1960, 74, (10).

Atkinson, R. C., & Shiffrin, R. M. Human memory: A proposed system and its control processes. In K. W. Spence and J. T. Spence (Eds.) The psychology of learning and motivation. vol. 2, New York:Academic Press, 1968.

Bjork, R. A. Positive forgetting: The noninterference of items intentionally forgotten. Journal of Verbal Learning and Verbal Behavior, 1970, 9, 255-268.

Bjork, R. A., LaBerge, D., & LeGrande, R. The modification of short term memory through instructions to forget. Psychonomic Science, 1968, 10, 55-56.

Bruce, D. & Papay, J. Primacy effects in single-trial free recall. Journal of Verbal Learning and Verbal Behavior, 1970, 9, 473-486.

Elmes, D. G. Supplementary report: Cueing to forget in short term memory. Journal of Experimental Psychology, 1969, 80, 561-562.

Elmes, D. G., Adams, C., & Roediger, H. Cued forgetting in short term memory: Response selection. Journal of Experimental Psychology, 1970, 86, 103-107.

Elmes, D. G., & Wilkinson, W. Cued forgetting in free recall: Grouping on the basis of relevance and category membership. Journal of Experimental Psychology, 1971, 87, 438-440.

Miller, G. A., & Bruner, J. S., & Postman, L. Familiarity of letter sequences and tachistoscopic identification. Journal of General Psychology, 1954, 50, 129-139.

Posner, M. I. & Rossman, E. The effects of size and location of information transforms upon short term retention. Journal of Experimental Psychology, 1965, 70, 496-505.

Shebilski, W., Wilder, L., & Epstein, W. Forget instructions: Effect of selective rehearsal and categorical distinctiveness. Journal of Experimental Psychology, 1971, 89, 372-378.

Thorndike, E., & Lorge, I. The teacher's word book of 30,000 words. New York:Columbia University Press.

Turvey, M. T., & Wittlinger, R. P. Attenuation of proactive interference in short term memory as a function of cueing to forget. Journal of Experimental Psychology, 1969, 80, 295-298.

Weiner, B., & Reed, H. Effects of the instructional sets to remember and to forget in short term retention: Studies of rehearsal control and retrieval inhibition (repression). Journal of Experimental Psychology, 1969, 79, 226-232.

Wickens, D. D. Encoding categories of words: An empirical approach to meaning. Psychological Review, 1970, 77, 1-15.

Woodward, A., & Bjork, R. Forgetting and remembering in free recall: Intentional and unintentional. Journal of Experimental Psychology, 1971, 89, 109-116.

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