

**A STUDY OF THE EFFECTS OF NATURAL  
LANGUAGE MEDIATION UPON RECALL IN  
A RETROACTIVE INHIBITION FRAMEWORK**

**BY**

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A STUDY OF THE EFFECTS OF NATURAL LANGUAGE  
MEDIATION UPON RECALL IN A RETROACTIVE  
INHIBITION FRAMEWORK

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Master of Arts  
in Psychology

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by  
Will Elliott Gauchat  
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To the Graduate Council:

I am submitting herewith a Research Paper written by Will Elliott Gauchat entitled "A Study of the Effects of Natural Language Mediation Upon Recall in a Retroactive Inhibition Framework." I recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Arts, with a major in Psychology.

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## INTRODUCTION

Natural language mediators (NLMs) are defined as the idiosyncratic associations or mediators that a subject (S) may impose upon verbal items when attempting to learn those items. NLMs are assessed by verbal report, either written or oral. The NLM may be an association of any complexity which S reports using in the learning process. Thus, in a paired associate design, the S might make a simple one word association between the words of a pair, one or more sentences, similarity of sounds, or associations between one or more letters of each pair. An example of an NLM in the learning of a three-consonant nonsense syllable (CCC) would be a S imposing "Hamlet" or "Her mother's tiara" on the syllable HMT (Groninger, 1966). Underwood and Schultz (1960, pp. 269-300) list NLMs obtained in postexperimental interviews along with examples of the many different kinds that are used. Research has shown that NLMs appear either to be a relevant variable for verbal acquisition and retention, or a correlate of relevant variables. The level of recall in both long-term memory (LTM) and short-term memory (STM) has been shown to be strongly related to the use of NLMs. Montague, Adams, and Kiess (1966) found recall in LTM of paired associates to be better in mediated pairs than for nonmediated ones for a retention interval of 24 hours. In this study recall of pairs was related to the presence of an NLM in acquisition, and recall of the NLM at the time of the retention test. Groninger (1966) conducted the first explicit study on the role of NLMs in short-term recall. He used a conventional short-term memory experimental design of learn and recall, using single CCC trigrams of high and low association-values, with a 30 sec. retention interval. After this interval, he asked his subjects to report the associations, if any, that they used in

remembering the item. Groninger found that NLMs improved recall for both high and low association-value items. As might be expected, high association-value material had more NLMs than low association-value. This finding is consistent with the LTM research on NLMs by Montague et. al. (1966), which was mentioned above.

A later set of experiments dealing with the relationship of NLMs to recall in STM was conducted by Kiess (Kiess, 1968). The purpose of these experiments was to investigate the relationship by varying the association-value (a) of the items to be learned and item presentation time (t). The findings showed association-value to have a strong effect both on number of NLMs given and on recall of consonant-vowel-consonant trigrams (CVC). The item presentation time was positively but weakly related to the number of NLMs given, and had no effect on the proportion of CVCs correctly recalled.

Research findings have shown evidence that NLMs reduce forgetting. The previously reported study by Groninger was primarily designed to evaluate the role of NLM formation on proactive inhibition (PI). He found that those items for which NLMs were formed were not only better retained but also more resistant to the effects of PI. Groninger's explanation for this finding is that the trigrams plus its NLM is a new verbal entity with a relative uniqueness and power to resist interfering effects of prize items. This explanation is essentially the same as that offered by Adams and Montague (1967) for NLMs and interference. In their study they investigated another important source of interference, retroactive inhibition (RI) and the effect of natural language mediators upon it. In this experiment the authors question how NLMs manifest themselves in original learning (OL) and interpolated learning (IL) and determine

recall of the OL list. They found that paired associates with NLMs were more resistant to retroactive inhibition than items without NLMs.

The present research also deals with NLMs and RI. The specific problem of the study was to compare the effects of different interpolated learning tasks (IL) on recall of original learning by making it more resistant to retroactive inhibition (RI).

### METHOD

Experimental Design. Three groups, two experimental and a control, were given the same OL list (A-B) of eight paired adjectives. All groups were required to successfully complete one errorless trial. The two experimental groups were differentiated by the IL lists which they were presented. Group 1 learned a list of eight paired adjectives whose stimulus items were the same as in the OL list. Thus, an A-B, A-C paradigm resulted. Group 2 was also presented a list of eight paired adjectives, but this list consisted of neutral pairs. Here an A-B, D-E order was arranged. Group 3 served as a control condition to provide a baseline for determining the amount of RI produced by the IL lists in the experimental groups. Group 3 was required to participate in the neutral activity of reading various copies of a periodical, Psychology Today, during the IL period. All groups were subject to the same recall procedure. The A term of the pair was given along with the method of association used in OL for the pair (whether it was an NLM or indication of rote learning) as the stimulus complex for recall of the B term. Recall was analyzed to assess the effects of NLMs in reducing RI.

Procedure. Each group was given a brief explanation of the procedure for paired associate learning. In addition, the initial instructions explained and gave examples of NLMs and encouraged S to form

them between stimulus and response members of a pair. Ss were also told that it would not always be possible to form an NLM and that there was nothing wrong with rote learning, which was defined as learning by memory alone without understanding or thought. After both OL and IL, the Ss filled out a questionnaire which gave the pairs. S was asked to write his NLM for each pair if he had one, and otherwise write 'rote' to indicate rote learning. Upon the advice given in a previous study by Adams and Montague (1967), it was decided to inform Ss of NLMs before OL so that IL pairs would have no bias favoring the formation of NLMs. This procedure eliminated the possibility that the questionnaire after OL would give some Ss ideas about forming NLMs that would increase the frequency of NLMs in IL.

In OL the pairs were learned to the criterion of one perfect trial, whereas, in IL six trials were administered to all Ss. From preliminary runs it was determined that six trials sufficiently exceeded the mean number of trials required to reach criterion in OL. More trials were given in IL than OL to increase the amount of retroactive inhibition (RI). Each trial began with the presentation of all item pairs typed on 3"x5" index cards. S was allowed 5 sec. to study and associate the stimulus and response members of each pair. This was followed by a recall-test sequence where only stimulus members of the pairs were presented and S had 10 sec. to respond to each. His response included the writing of both the stimulus and response terms on a slip of paper. This was necessary because the stimulus member cards were shuffled after each trial to insure randomization of presentation. Thus, any confusion as to which stimulus term was evoking the response term was avoided. The questionnaire for OL was given to the S when he reached criterion. After

all members of a group had completed the questionnaire, the six trials on the IL list were given along with a corresponding questionnaire immediately afterward. There was no time limit imposed upon completion of the questionnaire. After the IL questionnaire there was an unstructured 15-min. rest where the Ss were allowed to leave the experimental room. This time was utilized by E and associates to print each S's method of association for the OL pairs beside the stimulus words of the OL pairs. This was presented to S on a single sheet of paper and served as the stimulus for S's attempt to recall the response. In cases where S had the correct response explicitly embedded in the NLM, the NLM was modified slightly so that the response was not directly revealed. In instances where S indicated learning the pair by rote, the word 'rote' was written along with the stimulus term.

The word pairs for the two lists were taken from Madden, Adams, and Spence (1950). This follows the selection of these pairs made by Adams and Montague (1967) in their experiment dealing with retroactive inhibition and natural language mediation.

Subjects. There was originally a design for 45 Ss solicited from undergraduate psychology courses at Austin Peay State University. These Ss were assigned to groups based on their ability or willingness to meet at one of three time periods. These time periods were chosen with a consideration for the times most convenient for the most Ss. Participation in this particular experiment was urged but not required by the course instructors. As is commonly experienced, not all Ss were able to keep their appointments. Having realized this from past experiments, E arranged for 'extras' to be available. Unfortunately, the 'extras' were not enough to cancel out the 'extricated', leaving one group, the control, with only 12 Ss while the experimental groups each had the required 15 Ss.

One other point concerning Ss should be mentioned. Two of the Ss were dropped, one each from Groups 2 and 3. These Ss failed to reach criterion on the OL list. They both went four trials beyond any other member in their group and were at the point where self-consciousness and embarrassment were of sufficient magnitude to throw them completely off task.

### RESULTS

Recall. As shown in Table 1, final recall of the OL list for the three groups was tested by simple analysis of variance and did not differ significantly,  $F(2,37)=2.23, p>.05$ . Thus, there is no evidence from this study that the interpolated learning tasks significantly differed in their effect upon the Ss' ability to recall the original material.

TABLE 1

#### Analysis of Variance

Source	SS	df	ms	F	p
Total	121	39	----	----	----
Between groups	13	2	6.50	2.23	NS( $p>.05$ )
Within groups	108	37	2.92	----	----

Effects of Medication. Table 2 shows the interaction of correctness at recall and the type of associations used in learning OL for the total number of pairs of the groups combined. A simple chi-square was computed and was found to be highly significant,  $\chi^2=13.85, p<.001$ .

TABLE 2

Interaction of Correctness at Recall and Method of Association Used in OL (total number of pairs for the three groups combined)

	NLM	Rote	
Right	159	106	265
Wrong	18	37	55
	177	143	320

A test for significance of a proportion was carried out to see if the value for the proportion of correctly recalled responses using NLMs was significantly different from the value for the proportion of correct recall using rote memory. The results of the tests run for the two experimental groups were both highly significant,  $z = -2.71, 2.79, p < .01$  for both groups. The control group, however, failed to show a significant difference,  $z = 1.03, p > .05$ . When the responses of the individual groups were examined (see Table 3), it was found that the controls gave only five incorrect responses out of a total of eighty-eight. This was by far the highest percentage of correct responses among the three groups. This deficiency in number of incorrect responses given made it difficult to obtain a satisfactory evaluation of this group in relation to the question presented by the study.

Next, a statistic was computed by combining the three groups' proportion of correct recall using NLMs, and then testing to find if the proportion of correct recall using rote memory was significantly different. The result was highly significant,  $z = 6.201, p < .001$ . From this analysis, it can be seen that recall is significantly affected by the method of

association used in original learning. Furthermore, the effect on recall is positively related to the presence of NLMs in OL because pairs associated by NLMs in OL were recalled correctly in a significantly greater proportion than pairs associated by rote memory. The fact that the difference was highly significant when the groups were combined can be accounted for by the highly significant differences obtained in the two experimental groups outweighing the smaller, non-significant difference found in the control group.

TABLE 3

Proportion of Items Correct and Incorrect at Recall  
as a Function of Method of Association  
Used in OL

Group	NLM	Rote	
1	$\frac{53}{59}$ .898	$\frac{42}{61}$ .698	$\frac{95}{120}$ .792
2	$\frac{54}{61}$ .885	$\frac{33}{51}$ .647	$\frac{87}{112}$ .777
3	$\frac{52}{57}$ .912	$\frac{31}{31}$ 1.000	$\frac{83}{88}$ .943
	$\frac{159}{177}$ .898	$\frac{106}{143}$ .741	

## SUMMARY

This study produced several interesting results which should be examined and discussed. First, no significant difference in ability to affect the recall of OL was found among the three interpolated learning tasks. This would indicate that no significant amount of RI was established by the A-B, A-C paradigm. This finding was quite unanticipated but when qualified it may be seen as acceptable. The qualifier is that all groups were 'prompted' at recall by having their method of association supplied along with the stimulus term. It appeared that the inhibiting effects created by the same stimulus eliciting different responses were diminished beyond significance because the presentation of the method of association used in OL restored the A-B link.

The next result of interest was that there was a positive relationship between recall and the presence of NLMs in learning OL. This meant that OL pairs learned by NLMs were recalled better than pairs learned by rote memory. Normally this finding would have indicated that NLMs were related to a reduction in interference. Unfortunately, E found it impossible from this study to determine if this were a function of NLMs because there was not a significant amount of RI established.

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