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A study of the Skaggs-Robinson hypothesis.

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A STUDY OF THE SKAGGS-ROBINSON HYPOTHESIS



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A STUDY OF THE SKAGGS-ROBINSON HYPOTHESIS

by

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Introduction

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In 1927, Robinson(17, p.299), using conclusions drawn by Skaggs(19) in 1925, developed the following theory, which is known as the Skaggs-Robinson Hypothesis: "As similarity between interpolation and original memorization is reduced from near identity, retention falls away to a minimum and then rises again, but with decreasing similarity it never reaches the level obtained with maximum similarity." Thus, in terms of remembering and forgetting, this means that if you memorize A and then memorize some interpolated material, B, the success with which you will be able to recall A will depend on the similarity of B to A. That is, beginning at maximum similarity, as B becomes more dissimilar to A, the amount of forgetting of A will increase until a certain point is reached; after this point has been reached and B becomes even more dissimilar to A, the amount of forgetting will decrease. However, the amount of forgetting at maximum dissimilarity will always be greater than the amount of forgetting at maximum similarity.

The significance of this hypothesis and the far-reaching implications of its tenets have been recognized for some time, and consequently, much experimentation has been done on this subject. However, the results have been disappointing and no one has proved the hypothesis entirely.

It is to this end, then, that the present investigation has been undertaken. Specifically, the problem has been to determine whether the memorization of interpolated material varying in degrees of similarity to the original material, will result in a recall curve as described in the Skaggs-Robinson Hypothesis.

Since 1900, when Müller and Pilzecker(16) conducted their studies on retroactive inhibition, many experiments have been performed to investigate this psychological phenomenon. The studies have fallen into three broad categories: those which have devoted themselves to the conditions of learning and recall; those which have investigated temporal relations of this occurrence; and those which have experimented with the similarity between original memorization and interpolated activity.

In 1935, Britt(1) published a comprehensive survey of the literature in the field from 1900 through 1934, and in 1941, Swenson(20) presented a review summarizing the findings that appeared during the years 1935 through 1940. This review, then, will confine itself to the experiments which are directly concerned with the Skaggs-Robinson Hypothesis and with studies done on retroaction since 1940.

The first paper of importance was by Robinson(18) in 1920. This was a series of three experiments in which fifteen subjects were used. In the first experiment a series of eight, four-place numbers was used as original learning, and three minutes were allowed in which to learn the list. Interpolated learning consisted of five different conditions: (a) memorizing numbers, (b) memorizing a list of consonants, (c) memorizing poetry, (d) multiplying four-place numbers by four-place numbers, (e) reading. Each of these activities was carried on for three minutes, each subject going through each of these five conditions, five times.

After the interpolated activity had been carried out, recall of the original numbers series with a pencil and paper was tested, after which recall of the interpolated material was also carried out. In terms of the amount of inhibition produced, the interpolated activities arranged them-

selves in descending order: memorizing numbers, memorizing poetry, memorizing consonants, reading and multiplying numbers.

The second experiment used the same original activity as the first. However, the interpolated activities differed. The five interpolated activities were: (a) memorizing numbers, as in the first experiment, (b) memorizing thirty two digits, (c) mental multiplication, (d) looking at pictures, (e) reading a newspaper. The results showed that inhibition was greatest after the first interpolated activity and was least after the last.

The third experiment in this study used only six subjects. The original learning consisted of studying a chance arrangement of six chess men on a chess board. There were three interpolated activities: (a) studying another set of chess men, (b) multiplying two-place by two-place numbers, (c) reading. Again, all the subjects went through all the tests. The results showed that inhibition was greatest after the first activity, less after the second, and least after the last.

From the results of the three studies Robinson came to the conclusion that greater inhibitory effects were exhibited after very similar interpolation, but that marked inhibition also occurred where the original and the interpolated material were comparatively dissimilar.

In 1925, Skaggs (19, p. 264) published his studies on retroaction. He did several experiments, which included reconstruction tests, sense word experiments, and nonsense syllable experiments. He tried the effect of practice on retroaction, the effect of varying the temporal positions, the effect of rest and work intervals, and the effect of similar versus dissimilar work. The following conclusions were drawn:

"A. When work and original learning are identical in content and method, there is only reinforcement on repetition. There is no inhibition.

B. As the material is made, by degrees, more and more dissimilar, the reinforcing factors gradually diminish in effectiveness and the interfering factors become more and more pronounced.

C. As the material of learning and work is made more dissimilar, a point is reached where there is a maximum of interference or detrimental influence wrought upon the original learning.

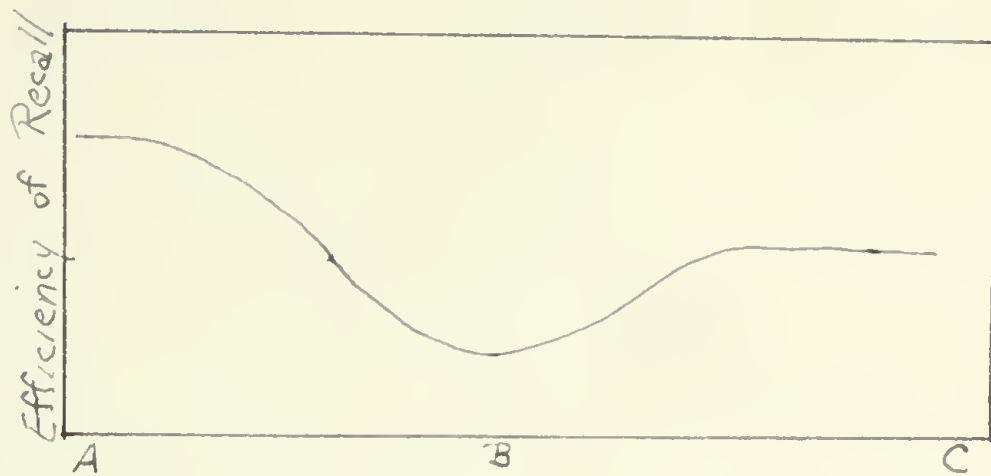
D. Beyond this point the curve of interference or detrimental influence goes downward, and then we can say that the more dissimilar the material, the LESS the detrimental influence.

E. However, the curve of detrimental influence never reaches zero because after the work and learning are as different as can possibly be made, there is still a damaging influence exerted by the work."

In explaining his failure to substantiate these conclusions, Skaggs stated that it had been very difficult to make out a graded series of work activities which differed in degrees of similarity from the original learning.

Using his own work and that of Skaggs, Robinson(17, p.299) set forth his postulate which has since become known as the Skaggs-Robinson Hypothesis. It is as follows: "As similarity between interpolation and original memorization is reduced from near identity, retention falls away to a minimum and then rises again, but with decreasing similarity it never reaches the level obtained with maximum similarity." (See Figure 1, p.7)

In an effort to prove this hypothesis, Robinson conducted a series of three experiments. They were set up in the following manner:



Degree of Similarity Between Interpolated Activity and
Original Memorization - Descending Scale

Skaggs-Robinson Hypothesis - Concerning Relation Between
Similarity and Efficiency of Recall (17)

Figure 1

At A, the interpolated activity and the original memorization are identical, and recall is at its highest level of efficiency. As this similarity approaches its minimum at C, it passes through an intermediate degree, B, where recall is at its lowest level of efficiency. After this point has been passed, there is an increase in the amount of recall, but this increase does not reach the level obtained at A.

There was an original list of four consonants and an interpolated list of four consonants which were presented as a continuous list of eight consonants. At the conclusion of the exposure of the eighth letter, the subject was to write his recall in the order in which the characters had appeared. He was not to retrace his steps in that recall.

The stimuli were presented visually and each consonant was in view for 0.5 sec. Sixteen different lists were drawn up to compensate for the positional factor. The lists may be diagrammatically represented in the following way:

<u>Degree of Identity</u>	<u>Arrangement of Items</u>
None in common	a b c d e f g h
One in common	a b c d a f g h a b c d e b g h a b c d e f c h a b c d e f g d
Two in common	a b c d a b g h a b c d a f c h a b c d a f g d a b c d e b c h a b c d e b g d a b c d e f c h
Three in common	a b c d a b c h a b c d a f c d a b c d e b c d a b c d a b g d
Four in common	a b c d a b c d

Twenty graduate students in a training course in experimental psychology acted alternately as subject and experimenter. After the presentation and recall under one of the sixteen experimental conditions, the subject and the experimenter exchanged places. In a single sitting, each person performed once under each of the experimental conditions.

The results of this experiment are shown graphically in Figure 2, p. 9.

In order that the differences developing during the progress of the experiment might be detected, Robinson arbitrarily divided the nine full repetitions of the experiment into successive thirds.

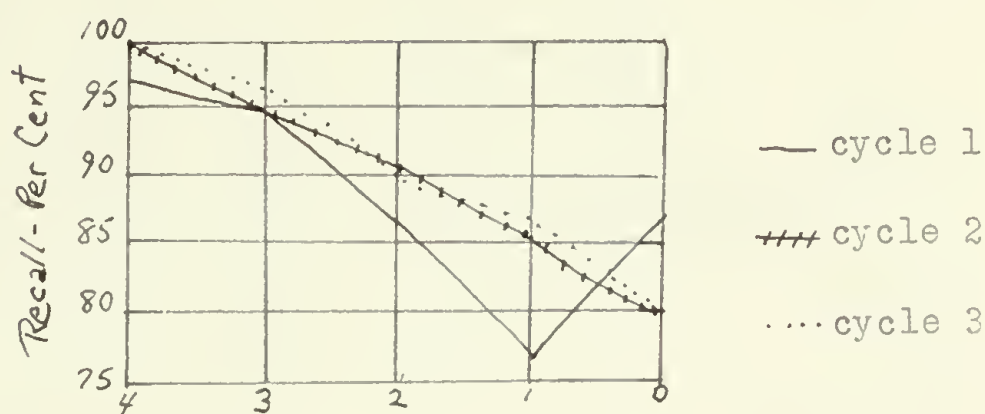


Figure 2 - Robinson's Recall Curves

The second experiment in this series was identical with the first except that this time auditory stimuli were used. The results were the same.

In the third experiment, twelve consonants were used, the first six corresponding to the original learning and the last six corresponding to the interpolated learning. This time, sixty-four different lists had to be constructed, and sixteen subjects were used. As in the second experiment, the auditory method was used. The results were the same: 87 per cent recall at maximum similarity and 33 per cent recall at minimum similarity, the inversion being absent. As Robinson(17, p. 306) pointed out in his conclusions: "However many may be the conditions under which there is a first order inversion in the debated function, there are demonstrable conditions under which such inversion is absent."

In an attempt to test the Skaggs-Robinson Hypothesis, Harden(4) devised the following experiment: She used two series of thirty lists

each. Each list contained eight members. The first four were consonants corresponding to the original learning, the remaining four were consonants and digits. In comparison with those used by Robinson, her lists may be diagrammatically represented as follows:

Elements in Common	<u>Robinson</u>		<u>Harden</u>	
	Original	Interpolated	Original	Interpolated
None	a b c d	e f g h	a b c d	1 2 3 4
One	a b c d	a f g h	a b c d	e 2 3 4
Two	a b c d	a b g h	a b c d	e f 3 4
Three	a b c d	a b c h	a b c d	e f g 4
Four	a b c d	a b c d	a b c d	e f g h

The conclusions of this experiment, based on results obtained from ten subjects, were that recall is more efficient when the original and the interpolated materials were most dissimilar than when these materials were similar or mixed.

In 1931, McGeoch(10) tested the influence of four different interpolated activities upon retention. Using twenty-four college girls as subjects, he carried out two experiments. The original learning consisted of a list of nine nonsense syllables. These were exposed ten times. Then, there was an interval of five minutes in which one of the following interpolated tasks was done: (a) rest, (b) learning another list, (c) naming colors, (d) and tapping.

The results indicated that the greatest amount of inhibition resulted from learning a second list of nonsense syllables and that the least occurred after tapping. As McGeoch(10, p. 412) said: "If three activities, tapping, color naming, and shock plus reading, are rated with respect to their similarity to learning nonsense syllables, although such similarity is in each case admittedly slight, it is clear that color naming and shock

11.

plus reading are more similar to the original learning than is tapping. The experiments agree in placing tapping lowest in amount of inhibition produced. The relationships involved are not sufficiently certain to have more than a suggestive value, of course."

In another experiment, McGeoch and McDonald(14) again tried to verify the Skaggs-Robinson Hypothesis. In the first experiment, they used a list of eleven, two-syllable adjectives. The interpolated activities included: (a)rest, (b)a list of adjectives which were synonyms of the original list, (c)a list of adjectives which were antonyms of the original list, (d)a list of adjectives unrelated to the original list, (e)a list of nonsense syllables, and (f)a list of three place numbers. It was their belief that activity(b) was most similar to the original list, and that activity(f) was least similar. Twelve subjects learned the list by means of the memory drum.

The conclusions of this experiment were that the learning of interpolated lists of synonyms, antonyms, unrelated adjectives, nonsense syllables and three place numbers, produced retroactive inhibition in amounts which decrease steadily from synonyms to numbers. No sign of the inversion demanded by the Skaggs-Robinson Hypothesis appeared.

In another experiment, McGeoch and McDonald(14) used three lists of synonyms of the original list of adjectives as interpolated material. This was done to get a basis of similarity. Again, they reported that their results did not follow the Skaggs-Robinson predictions.

A novel design was developed by Dreis(2) in her work on retroactive inhibition. Using a pencil and paper substitution type test as the original learning, she had five different activities for interpolated learning. These included rest, and substitution tests like the original one, with 0, 2, 3,

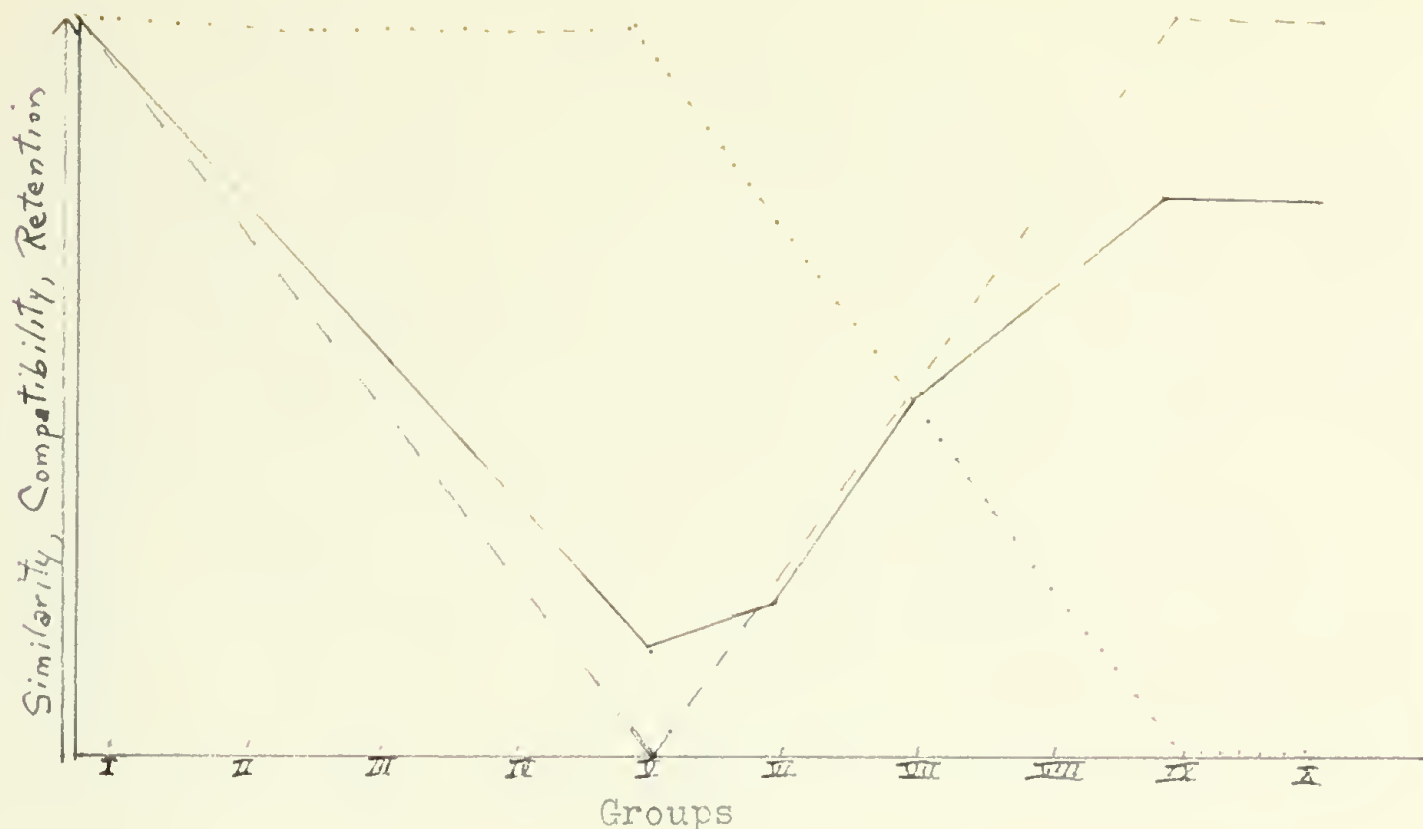
and 4 letters of the interpolated codes in common with the original one. Testing was done by the relearning method as measured by percentage of savings. Dreis concluded that a steady increase in saving is noted with an increase between similarity of the original learning and interpolated material. The theoretical inversion was not demonstrated.

Watson(22) carried out an experiment using card sorting as the original learning activity. This consisted of sorting eighty cards into sixteen compartments. The interpolated learning consisted of sorting cards, too, but with the following variations of patterns: (a) same as original pattern, (b) same numbers with four in different positions, (c) same numbers with eight in different positions, (d) same numbers with twelve in different positions, (e) same numbers with all in different positions, (f) same pattern as (e) except with four numbers replaced by letters, (g) eight numbers replaced by letters, (h) twelve numbers replaced by letters, (i) all numbers replaced by letters, and (j) an intelligence test used as interpolated material.

The retroaction curve which resulted is very similar to the curve of the Skaggs-Robinson Hypothesis. However, Watson(22, p.155) stated that ".....throughout the first five patterns there is complete similarity," so that his results in reality correspond only to the first half of the Skaggs-Robinson curve.

The results of Watson's study may be graphically represented in Figure 3.
p./3 .

In 1941, Kennelly(8) repeated the experiments done by Robinson and Harden, combining their two experiments into one. His results did not support the Skaggs-Robinson Hypothesis. He then performed a second experiment, still using numbers and consonants. He again failed to sub-



Relation Between Curves for Similarity(····), Compatibility(---), and R.I.

Figure 3

stantiate the curve.

In summing up the work that has been done on the similarity factor, Swenson(20, p. 13) says: "One comes to the conclusion that Robinson's theoretical curve is at least roughly accurate."

From the foregoing data, it is evident that the results of studies on the Skaggs-Robinson Hypothesis fall into two groups: (1) those by Robinson, by McGeoch and McDonald, by Dreis, by Watson, and by Kennelly, whose results proved the first half of the curve - that the amount of retroactive inhibition increases with a decrease of similarity between original and interpolated materials; and (2) those by Harden, and by McGeoch, whose results proved the last half of the curve - that the amount of retroactive inhibition decreases with a decrease of similarity between original and interpolated materials.

Problem

The problem in the present study has been to discover whether the memorization of interpolated material varying in degrees of similarity from the original material will result in a recall curve as described in the Skaggs-Robinson Hypothesis. Will recall actually be greatest at maximum similarity, least at the approximate mid-point between maximum and minimum similarity, and then rise again at minimum similarity? This was the problem to be studied in this investigation.

In considering the many experiments which have been carried out to test the effects of the similarity between interpolated activity and original activity in regard to the amount of retroactive inhibition produced, it becomes apparent that this problem has several basic issues involved which must be handled in every investigation of this type.

One of the most important considerations is the method of varying the degrees of similarity of the interpolated material. It is not too difficult to devise an interpolated activity which is almost identical with the original activity, nor is it too difficult to find some activity which is altogether different from the original activity. However, what is difficult is the preparation of activities along this continuum from complete similarity to complete dissimilarity, which differ from each other in degrees or "shades" of similarity. Skaggs(17), McGeoch(10), and Watson(20), suggested that the reason they failed to substantiate the Skaggs-Robinson curve was that they had found it difficult to make out a graded series of work activities which differed in degrees of similarity from the original learning.

To compensate for this factor, the present experiment was set up in the following way: A list of ten nonsense syllables was used as original learning. Then, ten other lists were drawn up to be used as interpolated

learning. The first list contained nine of the original nonsense , and one consonant syllable. This list was considered to be ninety per cent similar to the original list. The next list contained eight of the original nonsense syllables and two consonant syllables. This list was termed eighty per cent similar to the original list. The remaining lists were constructed in the same way, so that the last list was composed entirely of consonant syllables and was termed zero per cent similar to the original list. In this manner, the experimenter hoped to evolve a more mathematical or exact basis for varying the degrees of similarity between the original and the interpolated learning.

Another factor to be considered is the method of testing the amount of retroactive inhibition produced - whether to use relearning scores, which employ the savings method, or whether to use recall scores. Since Thune and Underwood(19) had found that recall scores tended to yield a more sensitive measure of retroactive inhibition than did relearning scores, this experiment used the method of recall to test the amount of retroactive inhibition produced.

It is believed that the results obtained in this experiment may be due to the manner in which the above variables were controlled. This is especially true of the way in which the degrees of similarity were taken care of.

Subjects, Apparatus, and Materials

Subjects

The subjects were fifty men and fifty women in the Sophomore Psychology classes in the University of Massachusetts. These students had volunteered to participate in this experiment. Their ages ranged from eighteen years to thirty years, with the mean at 20.1 years. The group was composed of many different majors, ranging from Accounting to Zoology.

The subjects were arbitrarily divided into ten equal groups. These groups were then equated on the basis of intelligence in the following manner: The composite scores which each person had made on the 1947 edition of the American Council on Education, ^{Psychological} Examination for College Freshmen, and the Belle, Modified Army Alpha Examination - Form 9, which were taken as Freshmen, served as the standards of their intelligence. Each group was composed so that it included one subject from each percentile level. That is, each group had one person whose composite score on the two afore-mentioned examinations fell into the 90th percentile level, one which fell into the 80th percentile level, one which fell into the 70th percentile level, etc.; also, each group was equated according to sex, so that each one was composed of five men and five women.

After setting up these ten equal groups, they were arbitrarily classified as: the 90 per cent similar group; the 80 per cent similar group; the 70 per cent similar group, etc., so that the last group was known as the 0 per cent similar group.

Apparatus and Materials

The testing room was thirteen feet long and eight feet wide and contained a desk and chair, plus a table upon which was the memory drum. The

subject sat in the chair facing the drum, and was separated from the Examiner by a white, canvas screen.

The memory drum was of the type described by Woodworth(24) and was electrically operated, rotating so that the syllables appeared for two seconds at a time every two seconds. The window of the drum was one-half inch high and four inches wide. The metal screen covering the rotating cylinder of the drum was painted a dull black.

A master list containing ten nonsense syllables and a cue(an *) at the beginning of the list was set up. The syllables were of equal association value and were taken from Hull's lists(6).

Ten other lists were arranged by the method explained under "Problem," p.15, so that list #1 was ninety per cent similar to the master list; list #2 was eighty per cent similar to the master list; list #3 was seventy per cent similar to the master list, etc., so that list #10 was zero per cent similar to the master list. (See Table 1, p.26)

The consonant syllables used in the interpolated lists were of equal association value and were all selected from Witmer's(23) lists.

In constructing the interpolated lists, the positional factor was considered. In which position, first, third, fifth, ninth, etc., should each new consonant substituted be placed? Would substituting the consonant in one position yield different amounts of retroactive inhibition than substituting the syllable in another position? On the basis of the results of the following two experiments, it was decided that the positional factor would not be influential, and consequently, this factor was not rigidly controlled.

The first experiment was done by McGeoch and McGeoch(13, p. 23). They wrote in their conclusions:"No clear variation occurs in degree of

inhibition when the synonyms in the interpolated list, instead of appearing in the same positions as their corresponding adjectives in the original list, are removed two or four positions, are presented in the reverse order, or are presented in a random order. Inhibitory potency is, thus, independent of the relative positions of the synonymous adjectives in the two lists. Serial position is, therefore, an unimportant factor in the production of inhibition under these conditions."

In a similar experiment Irion(7, p. 326) states: "The experiment was intended to investigate the effects of identical and changed serial order between the original and interpolated lists when the lists were composed of synonyms and when they were composed of identical words. The inhibitory action of changed serial position was found to be to a large extent a function of the material to be learned. The interpolated learning of the original material in a changed order was capable of producing as much inhibition as the interpolation of synonyms either in the same or in a changed order."

In interpreting the results of these studies, it must be remembered that the interpolated material consisted of synonyms of the original learning, whereas in the present investigation, the interpolated material was constructed of entirely new consonant syllables. Thus, although these two studies argue for the unimportance of the serial position, one must realize that these studies used synonyms and not consonant syllables, as were employed in the present investigation; and that any implications which are to be drawn are of indirect rather than of direct bearing.

A control which could be used to compensate for the positional factor could be modelled after the techniques adopted by Robinson(17), by

Harden(4), and by Kennelly(8). According to this method, many lists would be composed for each per cent similarity group. For example, in the 90 per cent similar group, ten lists would be composed. List #1 would have the substituted consonant syllable placed in the first position; list #2 would have the substituted consonant syllable placed in the second position; list #3 would have the substituted consonant syllable placed in the third position, etc., so that the tenth list would have the substituted consonant syllable placed in the tenth position. This same method would be followed for the other per cent similar groups, so that each position would be taken care of. In this way, the positional factor could be adequately controlled.

It is obvious that such a method would necessitate the composition of many lists; this factor, plus the need to supply at least ten subjects for the testing of each list, makes this plan almost impossible to carry out. However, if it could be done, the factor of serial position would be controlled.

Procedure

The general plan of the procedure of this study was as follows:

Each subject, working individually and not as a group, learned an original list of ten nonsense syllables. After he had done this, he was given an interpolated list of syllables to be learned. When this had been accomplished, recall of the original list of nonsense syllables was tested, and retroactive inhibition was measured by the number of syllables which were omitted or misplaced, plus the number of incorrect syllables which were given.

A more detailed account of the procedure followed is given below:

Each subject filled out a data sheet and was then given a set of instructions which he read before beginning the experiment. They were as follows: (5, p. 202)

"This is an experiment in learning a list of nonsense syllables, and not a psychological test. We are interested in certain complex relations of the learning process common to all people, and not concerned with your personal reactions.

"Shortly after the apparatus starts you will see a 3 letter syllable in the window. You are to pronounce this syllable and the ones that follow it as you see them. After you have seen the list once you are to endeavor to anticipate the syllables; in other words, as you see one syllable you are to pronounce the syllable that will follow it BEFORE it appears. If you think that you know what a syllable will be but are not sure, guess, because it will not hurt your score anymore than to say nothing, and if you guess it right it will count as a success. If you anticipate a syllable incorrectly, correct yourself as soon as it appears. Always try to speak the syllables as distinctly as possible.

"Please do not try to think ahead more than one step at a time, or to count, or to make up fanciful connections between the syllables to assist

the learning process. Don't try to use any special system in your learning; simply associate each syllable with the next one as the series moves along."

Learning was by the method of serial anticipation, as explained in the instructions. Thus, when a subject was able to say all ten syllables, using the preceding syllable as a cue for the one that was to follow it, then it could be said that the subject had learned the list.

Successive presentations of the lists were separated by approximately thirty seconds, the order of presentation being constant throughout.

After the subject had learned the master list to a criterion of one successful repetition of the entire list, he was given the following set of instructions to read:

"The same rules apply as in the first part of the experiment except that this time some NEW syllables will be interspersed with the old syllables. These NEW syllables are to be spelled rather than pronounced. Aside from this new provision the rules to follow are exactly the same as in the first part."

The subject was now given an interpolated list to be learned, the list being given to him depending in which group the subject had been placed. For example, if he had been placed in the 90 per cent similar group, he was given an interpolated list to learn which was 90 per cent similar to the master list; if he were in the 80 per cent similar group, he was given a list which was 80 per cent similar to the master list, etc. After he had learned the second list to the same criterion as he had the first, the subject was asked to repeat the first list. At this time, a blank sheet of paper was placed on the memory drum, and the experimenter said: "This is a blank sheet of paper. When the asterisk appears in the window of the memory drum, you are to repeat the first list that you learned in the same

order that you learned it." Each subject appeared but once in the entire experiment.

Criticism might justifiably be directed at the criterion of learning which was employed, namely, that of repeating the entire list correctly. once. Using such a criterion, subjects having an interpolated list of 30 per cent similarity to the original list would need more repetitions to meet the criterion than subjects in the 90 per cent similarity group. However, a control of the variable of numbers of repetitions to learn the interpolated material at the different levels of similarity is probably not possible unless a massive, extensive procedure were to be followed.

Scoring

An error was scored if a syllable was omitted, if an incorrect syllable was given, or if a syllable was placed in the wrong sequence. Retention was measured by the per cent of the original list which was repeated after learning of the interpolated list.

Table 1
Learning Lists Used

<u>Original List</u>	<u>90% List</u>	<u>80% List</u>	<u>70% List</u>	<u>60% List</u>		<u>50% List</u>	<u>40% List</u>	<u>30% List</u>	<u>20% List</u>	<u>10% List</u>	<u>0% List</u>
KEJ	KEJ	KEJ	KEJ	KEJ		KEJ	FPC	FPC	FPC	FPC	FPC
MIV	MIV	MIV	BHJ	BHJ		BHJ	BEJ	BHJ	BHJ	BHJ	BHJ
HAJ	HAJ	HAJ	HAJ	HAJ		HAJ	HAJ	HAJ	XZF	XZF	XZF
YUF	YUF	YUF	YUF	YUF		YUF	YUF	BPJ	BPJ	BPJ	BPJ
WBH	WBH	WBH	WBH	WBH		WBH	WBH	WBH	WBH	WBH	WBH
VEF	VEF	VEF	VEF	VEF		VEF	VEF	VEF	VEF	QJF	QJF
MAF	MAF	GXX	GXX	GXX		GXX	GXX	GXX	GXX	GXX	GXX
TUJ	TUJ	TUJ	TUJ	TUJ		TUJ	TUJ	TUJ	TUJ	TUJ	DJW
VAB	VAB	VAB	VAB	HFC		HFC	HFC	HFC	HFC	HFC	HFC
FEP	FEP	FEP	FEP	FEP		LHJ	LHJ	LHJ	LHJ	LHJ	LHJ

Results

RELATIONSHIP BETWEEN SIMILARITY OF INTERPOLATED MATERIAL
AND RECALL OF ORIGINAL MATERIAL

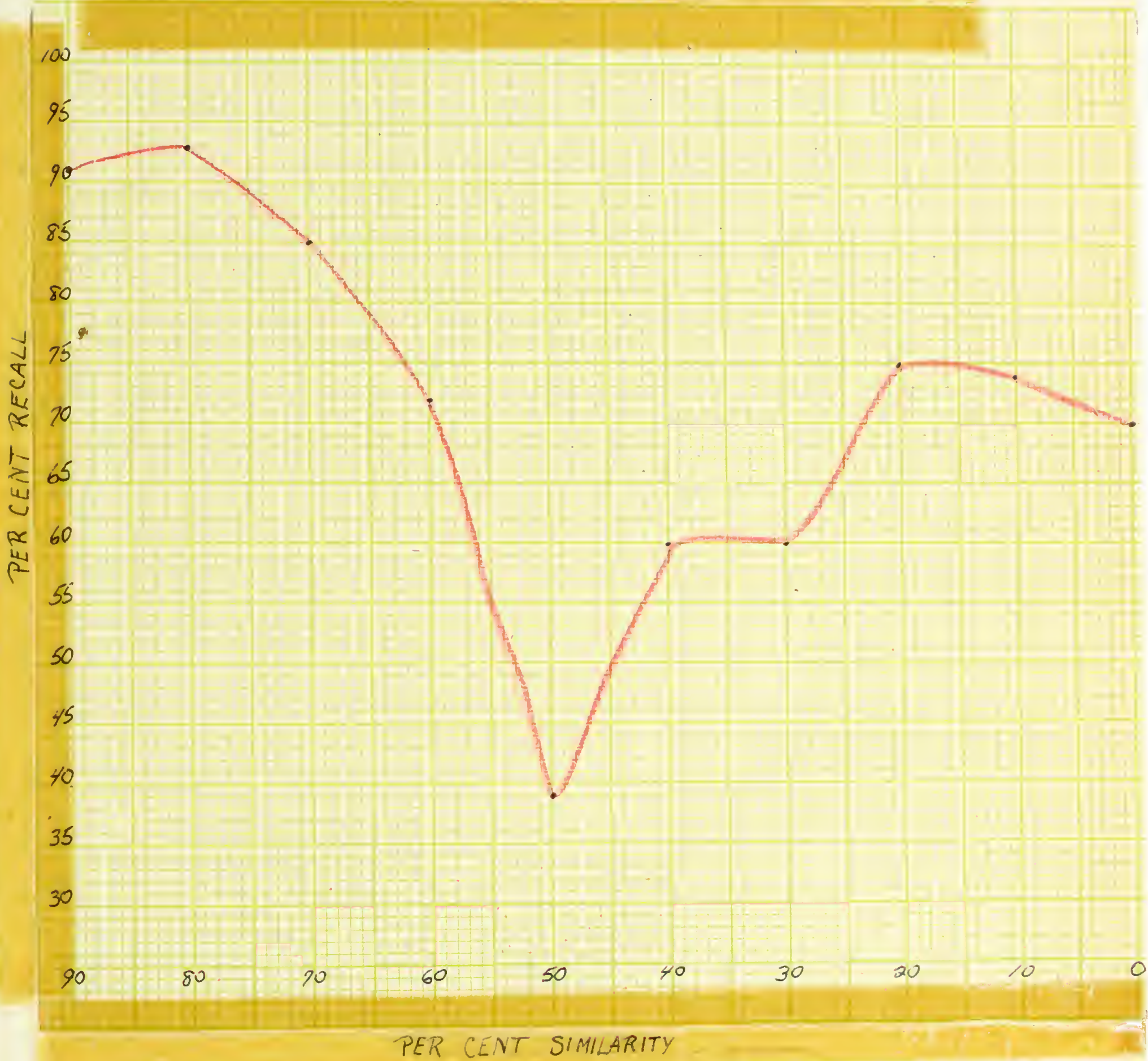


Figure 4

From the graph which plots the Mean scores of the amount of recall for each group, it would seem at first glance that the curve predicted by Robinson(17) has been verified. It remains now to be seen whether the differences between the mean scores of the amount of recall for each group are statistically reliable and to reexamine certain important details of the procedure to make sure that the results could not be due to factors other than the one specified in the Slaggs-Robinson Hypothesis, that of similarity.

T scores were computed. They represent the significance of the difference of the means of related measures. To compute t-scores, the following procedure is gone through:

The formula which is used is:

$$t = \frac{M \text{ diff}}{\sqrt{\frac{\frac{\sum \text{diff.}^2}{N} - \left(\frac{\sum \text{diff.}}{N}\right)^2}{N-1}}}$$

In computing the t-score between the 90 per cent group and the 30 per cent group, the difference between the means was found to be 0.2. The \sum differences squared equalled 26, and the \sum differences equalled 2. N equalled 10. With this information, it was a simple matter to substitute in the formula to get:

$$t = \frac{0.2}{\sqrt{\frac{\frac{26}{10} - \left(\frac{2}{10}\right)^2}{9}}} = .40$$

From the table of t-scores (See Table 2, p.30), and using Linquist's (9) tables to find the significance of a difference of the means of related measures, one finds that there are several scores which are significant.

Table 2
Computed t-scores

	90	80	70	60	50	40	30	20	10
90	0.40								
70	0.81	1.81							
60	<u>2.34</u>	<u>2.65</u>	1.81						
50	6.74	6.30	4.19	4.51					
40	<u>2.84</u>	3.55	<u>2.52</u>	0.96	1.68				
30	5.09	6.64	3.47	1.21	1.68	.00			
20	<u>2.75</u>	3.52	1.95	0.61	4.09	1.27	1.85		
10	1.66	2.23	1.04	0.18	<u>2.35</u>	.89	<u>2.50</u>	.09	
0	<u>2.26</u>	<u>2.40</u>	1.43	0.22	3.3585	.93	.83	.33

Significant[#] at:

1% level:.....

2% level:-----

3% level:-----

To find the t-value between two given per cents of similarity, read down the vertical column and across the horizontal column. Where the two coincide is the t-score.

In the first place, the difference of the mean scores between the 90 per cent group and the 50 per cent group is significant at the 1 per cent level. In other words, in only one time out of a hundred would these results

[#] Fisher, R.A. The Design of Experiments (1935) p. 201: Fisher proposed two confidence levels, called respectively the .05 and the .01 levels, and these may be accepted as standard for most experimental work.

have occurred by chance alone. This difference corresponds to the A-B part of the Skaggs-Robinson curve.

In the second place, the difference of the mean scores between the 50 per cent group and the 0 per cent group is also significant at the 1 per cent level. This, then, corresponds to the B-C part of the Skaggs-Robinson curve.

From Table 2, p.30, one sees that the difference of the means of the 80 per cent group and the 30 per cent group is significant at the 1 per cent level, corresponding to the A-B part of the hypothesis; also, the difference between the scores of the 30 per cent group and the 10 per cent group is also significant, thus yielding the inversion.

Although these differences between the mean scores of the amount of recall for each group are statistically significant, one is not entirely justified in saying that the Skaggs-Robinson Hypothesis has been verified. This is due to the lack of adequate control of the serial positions of the interpolated consonant syllables and of the frequency of repetitions for each of the per cent levels of the interpolated lists. The attempt to control the first variable was discussed under Apparatus and Materials, p./9. The second variable, however, was not adequately cared for. Since the criterion of learning was one correct repetition of the entire list, the data bearing on the frequency of repetitions necessary for each subject to learn the original list and the interpolated list was not collected. According to a study carried out by Melton and Irwin(15, p. 202): "All measures show an increase in retroactive inhibition with early increases in the degree of interpolated learning and a decrease in retroactive inhibition with very high degrees of interpolated learning." In other words,

since the frequency of repetitions for each of the per cent levels of the interpolated lists was not controlled and since a record was not kept of the number of trials necessary to reach the criterion of learning for each different per cent level, the curve which has resulted cannot be explained definitely on a basis of the Skaggs-Robinson Hypothesis. It is likely that it could be, but a conclusion to this effect is not justified.

Summary and Conclusions

1. This experiment was undertaken in an attempt to obtain evidence bearing on the Skaggs-Robinson Hypothesis, which is: "As similarity between interpolation and original memorization is reduced from near identity, retention falls away to a minimum and then rises again, but with decreasing similarity it never reaches the level obtained with maximum similarity."
2. One hundred subjects volunteered for this experiment, fifty males and fifty females. They ranged in age from eighteen years to thirty years, the mean age being at 20.1 years, and all were students in the Sophomore classes of Psychology at the University of Massachusetts.
3. The subjects were divided into ten equal groups, and were equated on the basis of intelligence, using the composite scores of the 1947 edition of the American Council on Education, Psychological Examination for College Freshmen, and the Wells Modified Army Alpha Examination-Form 9, as the criterion of intelligence. These ten equal groups were then designated as the 90 per cent group, the 80 per cent group, the 70 per cent group, etc., on to the 0 per cent group.
4. Each subject learned a list of ten nonsense syllables (called the master list) to a criterion of one perfect repetition by means of the anticipation method on a memory drum. After this was done, the subject was given a second list to learn. The make-up of the second list depended on the group into which the subject had been classified. For example, if the subject were in the 90 per cent group, the second list was the same as the master list except that now one nonsense syllable had been replaced with a consonant syllable. If the subject were in the 80 per cent group, the second list was the same as the master list except

that it now contained two consonant syllables replacing two of the non-sense syllables of the master list. If the subject were in the 0 per cent group, the second list was composed of ten consonant syllables.

After the subject had learned the second list to the same criterion as he had learned the master list, correctly anticipating the entire list once, he was asked to repeat the master list as he had learned it.

5. Errors were scored if the wrong syllable were given, if one were omitted, or if a syllable were given in the wrong sequence.

6. The results when plotted yield a curve similar to that predicted by the Skaggs-Robinson Hypothesis, but for reasons cited under Results, p.31, a conclusion that the Skaggs-Robinson Hypothesis has been substantiated is not entirely justified.

References

1. Britt, S.H. Retroactive Inhibition: A Review of the Literature,
Psychological Bulletin, 32, 1935
2. Dreis, T.A. Two Studies in Retroaction - I. Influence of Partial
Identity; II. Susceptibility to Retroaction at Various
Grade Levels, Journal of General Psychology, 1938, 8,
152-172
3. Fisher, R.A. The Design of Experiments (1935)
4. Harden, L.M. A Quantitative Study of the Similarity Factor in
Retroactive Inhibition, Journal of General Psychology,
1929, 2, 421-432
5. Hovland, C.I. Experimental Studies in Rote Learning Theory, Journal
of Experimental Psychology, 1938, 22, 201-204
6. Hull, C.L. The Association Value of 320 Nonsense Syllables, American
Journal of Psychology, 1933, 45, 730-734
7. Irion, A.L. Retroactive Inhibition as a Function of the Relative
Serial Positions of the Original and Interpolated Items.
Proc. Ia. Acad. Sci., 1941, 48, 325-329
8. Kennelly, T.W. The Role of Similarity in Retroactive Inhibition,
Archives of Psychology, N.Y., 1941, 55
9. Lindquist, E.F. Statistical Analysis in Educational Research. Houghton
Mifflin Co., 1940
10. McGeoch, J.A. The Influence of Four Different Interpolated Activities
Upon Retention, Journal of Experimental Psychology, 1931,
14, 400-413
11. McGeoch, J.A. Retroactive Inhibition as a Function of the Length
and Frequency of Presentation of the Interpolated Lists.
Journal of Experimental Psychology, 1936, 19, 674-693

12. McGeoch, J.A. The Psychology of Human Learning, An Introduction, Longmans, Green and Co., N.Y. 1942
13. McGeoch, J.A. and McGeoch, G.O. Studies in Retroactive Inhibition: VI. The Influence of the Relative Serial Positions of Interpolated Synonyms, Journal of Experimental Psychology, Vol. 19, 1936
14. McGeoch, J.A. and McDonald, W.T. Meaningful Relation and Retroactive Inhibition, American Journal of Psychology, 1931, 43, 579-88
15. Melton, A.W. and Irwin, J.M. The Influence of Degree of Interpolated Learning on Retroactive Inhibition and the Overt Transfer of Specific Responses. American Journal of Psychology, 1940, 53, 173-203
16. Muller, G.E., and Pilzecker, A. Experimentelle Beitrage zur Lehre vom Gedachtniss. Z. Psychol., 1900, Ergbd. 1 (Not read in original)
17. Robinson, E.S. The Similarity Factor in Retroaction, American Journal of Psychology, 1927, 39, 297-312
18. Robinson, E.S. Some Factors Determining the Degree of R.I. The Psychological Monographs, Vol. 28, 1920
19. Skaggs, E.B. Further Studies in Retroactive Inhibition, Psychological Monographs, 1925, 34, No. 161
20. Swenson, E.J. Retroactive Inhibition: A Review of the Literature. Minneapolis: Univ. Minnesota Press, 1941
21. Thune, L.E. and Underwood, B.J. Retroactive Inhibition as a Function of Degrees of Interpolated Learning, Journal of Experimental Psychology, 1943, 32, 185-200

22. Watson, B. The Similarity Factor in Transfer and Inhibition,
Journal of Educational Psychology, 1938, 29, 145-157
23. Witmer, L.R. The Association Value of Three-Place Consonant
Syllables. J. Genet. Psychol., 1935, 47, 337-359
24. Woodworth, R.S. Experimental Psychology, New York, Henry Holt
and Co., 1938

Appendix

Data Concerning the Subjects

90% Group

<u>Sex</u>	<u>Age</u>	<u>Major</u>
M	24	Dairy Industry
M	21	Dairy Industry
F	20	Languages
M	19	Science
F	19	Science
M	20	Chemistry
F	20	Bus. Ad.
F	19	Sociology
M	20	Science
F	20	Liberal Arts

80% Group

<u>Sex</u>	<u>Age</u>	<u>Major</u>
M	20	Science
F	19	Home Ec.
F	21	Chemistry
F	19	Home Ec.
F	19	Languages
F	20	Sociology
M	19	Bus. Ad.
M	19	Math.
M	24	Engineering
M	21	English

70% Group

<u>Sex</u>	<u>Age</u>	<u>Major</u>
F	20	Home Ec.
M	24	Engineering
M	24	English
F	19	Languages
F	30	Phys. Ed.
M	20	Acct.
F	20	Bus. Ad.
M	20	English
M	19	Science
F	19	Home Ec.

60% Group

<u>Sex</u>	<u>Age</u>	<u>Major</u>
F	19	Floriculture
M	20	Science
M	20	Chemistry
M	19	Acct.
F	19	Food Tech.
F	20	Zoology
F	20	Bact.
F	20	French
M	20	Poultry
M	19	Engineering

50% Group

<u>Sex</u>	<u>Age</u>	<u>Major</u>
M	22	Economics
M	19	Pre-Med.
F	19	Home Ec.
F	19	Math.
F	20	Home Ec.
M	24	Bus. Ad.
M	20	Zoology
F	19	Science
F	19	Phys. Ed.
M	21	Phys. Ed.

40% Group

<u>Sex</u>	<u>Age</u>	<u>Major</u>
M	20	Science
M	24	History
M	21	Undecided
F	20	Liberal Arts
M	20	Bus. Ad.
F	20	Phys. Ed.
M	21	Pomology
F	20	Home Ec.
F	19	Languages
F	19	Psychology

30% Group

<u>Sex</u>	<u>Age</u>	<u>Major</u>
M	19	Bus. Ad.
M	25	Bus. Ad.
M	22	Poli. Sci.
F	19	Poli. Sci.
F	19	Food Tech.
F	19	Home Ec.
F	19	Sociology
M	20	Economics
F	19	Home Ec.
M	20	Economics

20% Group

<u>Sex</u>	<u>Age</u>	<u>Major</u>
M	19	Liberal Arts
M	20	Bus. Ad.
F	20	Undecided
F	19	Psychology
F	19	Poli. Sci.
M	18	Animal Husbandry
M	19	Pomology
M	23	Phys. Ed.
F	19	Psychology
F	18	Home Ec.

10% Group

<u>Sex</u>	<u>Age</u>	<u>Major</u>
F	19	English
M	22	History
M	21	Forestry
F	20	Ent.
M	19	Bus. Ad.
M	23	Math.
F	19	Math.
F	20	Home Ec.
F	21	History
M	20	Liberal Arts

0% Group

<u>Sex</u>	<u>Age</u>	<u>Major</u>
M	20	Bus. Ad.
M	19	Physics
F	20	Liberal Arts
F	19	History
M	20	Dairy Industry
F	19	English
M	20	Phys. Ed.
F	20	Home Ec.
M	19	Economics
F	19	English

Presentation of Data

90% Similar Group

<u>Subjects</u>	<u>Percentile Rank on Composite A.C.E. and Army Alpha</u>	<u>Per Cent Recall</u>
A	.938	100%
B	.849	100%
C	.756	100%
D	.638	90%
E	.542	70%
F	.431	90%
G	.382	60%
H	.217	100%
I	.133	100%
J	.081	100%

80% Similar Group

A	.954	90%
B	.806	100%
C	.735	100%
D	.606	100%
E	.542	90%
F	.452	90%
G	.327	100%
H	.287	100%
I	.161	90%
J	.016	70%

70% Similar Group

A	.960	50%
B	.834	90%
C	.785	80%
D	.608	100%
E	.530	90%
F	.433	90%
G	.375	90%
H	.258	90%
I	.142	90%
J	.069	80%

60% Similar Group

A	.974	70%
B	.882	50%
C	.722	80%
D	.626	50%
E	.574	80%
F	.465	90%
G	.375	40%
H	.209	80%
I	.178	90%
J	.035	90%

50% Similar Group

A	.938	80%
B	.864	40%
C	.776	60%
D	.679	20%
E	.542	10%
F	.476	50%
G	.327	0%
H	.234	40%
I	.185	60%
J	.053	30%

40% Similar Group

A	.960	70%
B	.894	90%
C	.756	30%
D	.626	100%
E	.516	70%
F	.476	50%
G	.304	20%
H	.258	100%
I	.178	30%
J	.069	40%

30% Similar Group

A	.934	50%
B	.882	80%
C	.707	80%
D	.692	40%
E	.542	50%
F	.433	40%
G	.350	80%
H	.272	70%
I	.127	80%
J	.058	30%

20% Similar Group

A	.974	60%
B	.894	80%
C	.756	80%
D	.638	70%
E	.551	70%
F	.484	80%
G	.350	70%
H	.227	60%
I	.194	80%
J	.010	100%

10% Similar Group

A	.904	60%
B	.806	100%
C	.792	100%
D	.673	20%
E	.542	100%
F	.406	60%
G	.304	100%
H	.234	70%
I	.111	90%
J	.087	40%

0% Similar Group

A	.920	80%
B	.876	90%
C	.734	80%
D	.692	40%
E	.502	50%
F	.418	100%
G	.374	70%
H	.258	30%
I	.123	60%
J	.035	100%

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