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Input Order, Subjective Organization and Free Recall

John Earle Langhorne Jr.

INPUT ORDER, SUBJECTIVE ORGANIZATION AND FREE RECALL

by
John Earle Langhorne, Jr.

Bachelor of Science, Montana State University 1966
Master of Science, University of North Dakota 1968

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This dissertation submitted by John Earle Langhorne, Jr. in partial fulfillment of the requirements for the Degree of Doctor of Philosophy from the University of North Dakota is hereby approved by the Faculty Advisory Committee under whom the work has been done.

Robert S. Beecroft
(Chairman)

R H Kolstoe

John B. Cannon

Dean of the Graduate School

Permission

Title INPUT ORDER, SUBJECTIVE ORGANIZATION AND FREE RECALL

Department Psychology

Degree Doctor of Philosophy

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Date 7/30/70

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ABSTRACT

Considerable current research on memory has focused on the organization of subjects' recall. When the organizational characteristics of a stimulus list are not apparent, subjects will uniquely organize their outputs to facilitate recall. Both Tulving and Bousfield have developed statistics to measure this subjective organization in multitrial free recall experiments. These two measures have been shown to intercorrelate very highly. Substantial correlations are reported between these measures and recall.

During a previous study on subjective organization the recall data from each subject on each trial were scored in such a way that the ordinal position in recall of each word was known. It was then possible to correlate each consecutive pair of trials and obtain the amount of variance shared by the pair. This was called intertrial organization variance (ITOV) and was shown to be a better measure of subjective organization than previous statistics.

The effects of variable and constant input order on free recall were first examined by Waugh (1961). She concluded that order of presentation did not produce differences in recall, although later studies (e.g., Wallace and Nappe, 1970) have indicated appreciably better recall and organization from constant-order lists.

Tulving (1964) suggested a theoretical model of free recall based upon the assumption that all the items presented to a subject are learned and forgetting explains imperfect recall. This model utilizes contingent probabilities of intertrial and intratrial retention to describe learning curves. Tulving calls this the trial-to-trial (TTT) analysis. If the model is used not as a theoretical formulation but as an analytic tool it becomes particularly appropriate to the analysis of input order effects.

This study analyzed the effects of constant and variable input orders in subjective organization using the ITOV measure, and retention-forgetting using the TTT model. Results of two experiments, the second a replication with the substitution of a different list of items, provided strong evidence that constant-order lists are more easily organized and recalled than variable-order lists. ITOV was significantly higher for constant input lists and correlated substantially with recall. Variable-order lists showed more forgetting while the constant-input lists produced greater retention.

The clear-cut results provide further evidence that the ITOV statistic is a good measure of subjective organization. Additionally, the Tulving TTT model was shown to be a powerful data-analytic tool in the study of free-recall verbal learning.

CHAPTER I

HISTORY OF THE PROBLEM

Subjective Organization

In recent years considerable attention has been given to the problem of how organization affects memory. The free recall paradigm has been the primary method of studying organization. Because the subject's output orders are free to vary, organization is inferred from the ordering of such outputs in free recall. In an article on the limits of information processing capacity, Miller (1956) suggested that verbal learning is a direct consequence of the process of information recoding or organization. The fact that words which are categorically or associatively related tend to cluster together in recall has been well demonstrated (Shuell, 1969). However, such organization necessarily depends upon the experimenter's ability to identify and manipulate such organizational relationships within the input list.

Tulving (1962) suggested that when organizational characteristics of the stimulus list are not apparent, subjects will organize their outputs uniquely in order to learn the lists. This organization is inferred from the fact that trial-to-trial output orders are very similar or identical yet different from input order, especially where input order is variable. Tulving called this phenomenon subjective organization (SO) and developed a statistic derived from information theory to measure it.

A recall matrix is constructed for each subject such that rows represent the n-th word and the columns represent the (n+1)th word recalled. The row and column sums are computed and the following formula is used:

$$SO = \frac{\sum_{ij} n_{ij} \log_{ij}}{\sum_{i} n_i \log n_i}$$

The term n_{ij} represents the cell in the i-th row and the j-th column while n_i is the marginal total of the i-th row. The SO measure is the ratio of the obtained redundancy to the maximum possible redundancy. The value of SO can vary from zero to one, the latter being the case where the order of output is identical for the trials being considered.

Using a list of "unrelated" words, Tulving collected recall and SO data from 16 female subjects and also computed SO scores for 16 statistical subjects. The results showed an increase in SO across the 16 trials for the real subjects while the SO scores for the 16 stat-subjects did not change across the trials. Correlations between recall and SO ranged from +.45 to +.78, indicating a systematic relationship between these variables. Tulving also noted that there was substantial agreement in the organizational outputs of the different subjects.

Bousfield, Puff and Cowan (1964) developed and Bousfield and Bousfield (1966) refined an alternative measure of this type of organization. Their measure is called intertrial repetition (ITR) and is computed from a matrix similar to Tulving's. The Bousfield matrix does not have extra positions for no word preceding the first word and no word following the last word recalled. Bousfield's measure is the difference between the observed ITR from the recall matrix and an expected ITR value calculated by the following formula:

$$E\ (ITR) = \frac{C(C-1)}{hk}$$

where h is the number of words recalled on Trial n, k is the number of words recalled on Trial n+1, and C is the number of items common to both recalls. A method of converting the ITR score, which is a deviation measure, to a ratio measure was presented by Fagan (1968), thus making the ITR statistic more comparable to Tulving's measure.

Comparative data on the two measures were obtained by Puff and Hyson (1967). Their subjects were given 20 variable-input trials of a ten-word list. Tulving's SO statistic and Bousfield's ITR deviation measure were computed for each pair of trials. The correlation between mean SO and mean ITR across the 19 pairs of trials was .943. Correlations in excess of .90 were also found among subjects on each individual pair of trials. Lastly, SO and ITR values were obtained for each subject and correlated; this correlation was .972. Puff and Hyson concluded that attempts to integrate results of studies using the two measures are justified because the measures are so similar.

Subjective Organization Studies

Tulving (1964) argued that trial-by-trial increments in performance are functionally dependent upon organization. He presented evidence that SO scores increased across 22 trials for 32 experimental subjects while SO scores were very small and showed no increase for 32 statistical subjects. In addition, he obtained correlations ranging from .506 to .862 between SO and recall measures over blocks of trials.

In an experiment on learning to learn in free recall, Tulving, McNulty, and Ozier (1965) found evidence that increasing efficiency of performance over successive lists was accompanied by an increase in SO. They concluded that subjects were learning to organize successive lists and called this the "learning of subjective organization." The finding that SO increased across successive lists was replicated by Mayhew (1967). Mayhew also found that subjects who were explicitly instructed to organize did so better than those who were not.

Further evidence that performance is closely related to organization was presented by Tulving (1966) in four separate experiments. In the first two experiments he showed that more repetition of items in six continuous "reading" trials had no effect on learning the lists. The other experiments demonstrated that learning half the items from a list immediately prior to learning the whole list retarded learning the whole list. He hypothesized that this occurred because the organization developed in learning the half lists interfered with organizing the whole list. Tulving again concluded that increasing recall over successive trials was a consequence of SO and the development of higher-order memory units.

Earhart (1967) used total SO scores to dichotomize subjects into high and low organizers. She found that high organizers learned preferred order lists and non-preferred order lists equally well, while the low organizers performed better on the preferred-order lists. The high organizers also learned a serial-recall list better than the low organizers. On the basis of her results, Earhart suggested that SO might have general applicability as an individual difference in "learning ability."

Rehearsal and response cueing were thought by Allen (1968) to be the basic processes underlying organization in free recall. Although response cueing had no effect upon organization, Allen found increased opportunity for rehearsal improved organization as measured by Bousfield's ITR statistic. Substantial correlations between ITR and recall were also obtained. Following up Allen's finding that rehearsal is the primary variable which affects the development of organization, Wallace (1969) varied the conditions of recall during test trials to reduce the opportunity for rehearsal by the subjects. Using the ITR measure, he found that conditions which decrease the opportunity for rehearsal result in substantially lower organization scores. A further study by Wallace and Nappe (1970) examined the effects of constant versus random input order and fast (1 sec.) versus slow (2 sec.) stimulus presentation rates. Mean organization as measured by ITR was found to be greater for the slow-constant group and decreased systematically for the fast-constant, slow-random, and fast-random inputs in that order. Wallace and Nappe also noted a strong relationship between input order and mean ITR in the slow-constant group.

Laurence (1966) compared SO and performance data for groups of young adults, elderly adults, and children. She found the highest recall with the young adults, although the elderly group had slightly higher, though not significantly so, SO scores. Although this appears to be evidence against the organization-performance relationships, she con-concluded that the fact the elderly SO scores were higher is not inconsistent because people in that age category are often described as "rigid" or "inflexible" and the SO measured their inflexibility in recall. The relationship of increasing SO with increasing performance held up for the other groups.

These studies clearly demonstrate that subjective organization, as measured by two closely related statistics, does exist in multitrial free recall outputs and that it increases systematically across both trials and lists. Substantial evidence exists that increasing recall across trials is correlated with the development of higher-order memory units and that the ITR and SO statistics measure this organization.

Intertrial Organization Variance

Tulving (1965) used SO data from a previous experiment to construct two orders of a list of 16 words. The order similar to subjects' outputs he labeled High Organization while the other order, which was dissimilar to subjects' recall orders, he called Low Organization. Subjects given the High Organization order learned the list faster than subjects who were presented the Low Organization order of the same list. He concluded that this was due to the fact that the High Organization order was easier for the subjects to organize and consequently was easier to learn.

A careful examination of the orders led this experimenter to believe that the High Organization list was not simply easier to learn because it was easier to organize subjectively, but because of propitious serial position effects. To test this serial position hypothesis, Tulving's experiment was replicated and two list orders were added. The additional orders, both derived from the High Organization order, were a reverse High Organization order and a split-half High Organization order. In the split-half order, the High Organization order was retained but the first item of the split-half was the ninth item of the High Organization and so on. Separate groups of 12 females were tested for ten trials in each of the four conditions. Recall data showed superior performance for the reverse High Organization group. Examination of the serial position curves showed a powerful primacy effect operating in the reverse High Organization group. This primacy effect apparently was sufficient to produce the best recall for that group.

To examine organization, data were transformed into a recall matrix for each subject such that the position of every word recalled on every trial was known. Thus, for this experiment a 10 x 16 matrix (ten trials by 16 words) was constructed for each subject. Entries were ordinal positions in recall. Pearson product-moment correlations between all successive pairs of trials were computed. These correlations were then averaged over subjects, using the Fisher r-to-z transformation, and these averages were squared. The correlation squared is the ratio of the observed variance to the predicted variance, or, in this case, the amount of variance pairs of recalls have in common. This yields a measure of subjective organization that will be called intertrial organization variance (ITOV). This measure has several advantages over the statistics of Tulving and Bousfield.

Consider the following hypothetical data. A list of nine items is presented to a subject for two trials with recall after each trial. The input order on the trials may be constant or variable. The data are transcribed to a recall matrix of the type described above:

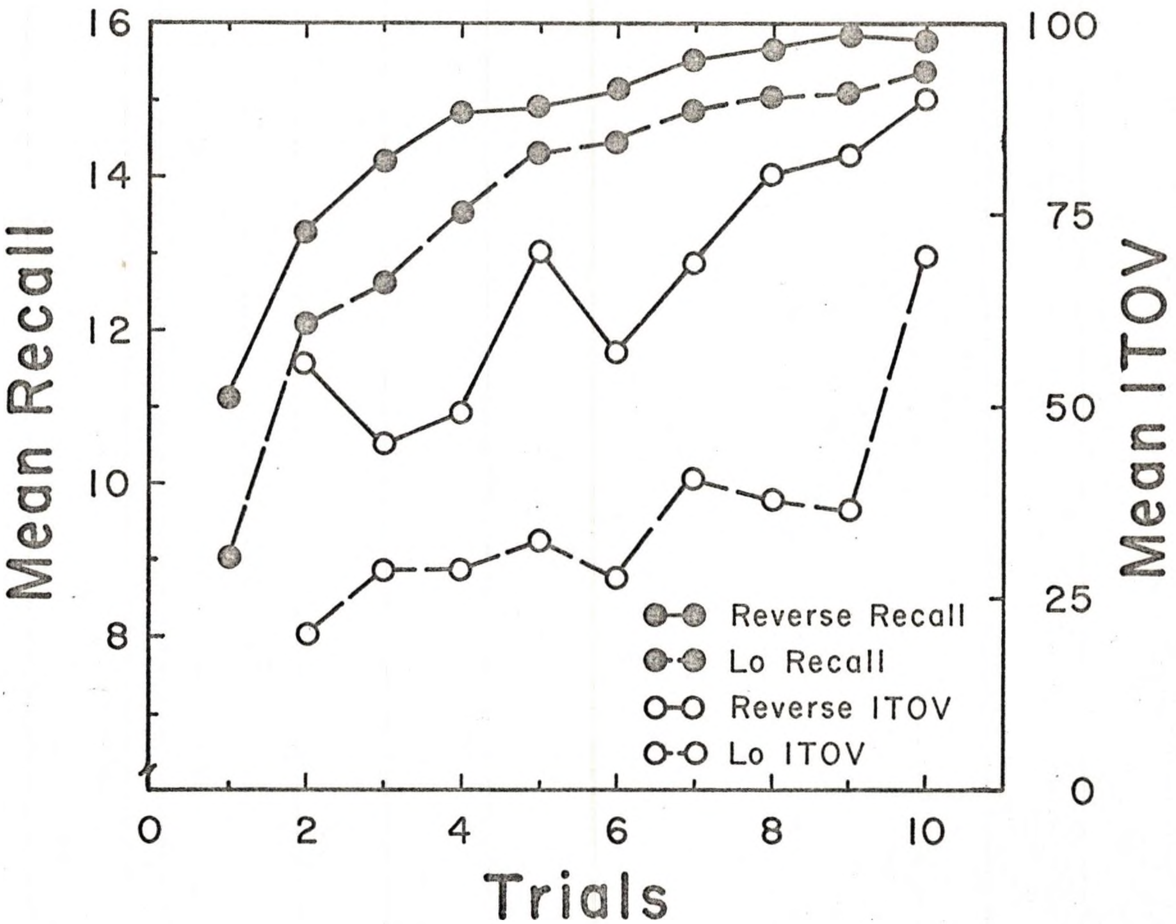
	Trial 1	Trial 2
A	-	1
B	-	2
C	1	3
D	2	4
E	3	5
F	4	6
G	5	7
H	6	8
I	-	9

The letters represent the words in the list and the numbers are their positions in recall for each of the trials. If a word is not recalled, no entry is made in that cell. Six words were recalled on Trial 1 and nine were recalled on Trial 2. From this data it is possible to compute the three measures of organization (SO, ITR, and ITOV). Computation of Tulving's SO measure gives a value of .943 which is the ratio of observed redundancy to maximum possible redundance. The Bousfield ITR deviation value is 4.45 which can be converted to a ratio measure using a method developed by Fagan (1968). The ratio measure, which Fagan calls sequential consistency is .889. The ITOV measure is obtained by correlating the items which are common to both outputs and squaring the correlation. The correlation of the above data is 1.00 and the ITOV is 1.00. Thus, the ITOV measure indicates that the organization is maximal for the above data while the other measures do not. For these two trials the outputs appear to have the maximum organization possible since the words common to the two recalls were recalled in exactly the same sequence. Therefore, the ITOV measure seems to be a more accurate measure of subjective organization.

Fagan (1968) states that the major weaknesses of Tulving's SO measure are that it is laborious to compute and there is no explicit way to determine what SO value to expect by chance. Shuell (1969) points out two weaknesses of Bousfield's statistic. First, it assumes that all items are equally available for recall on every trial and it is not clear how important the violation of this assumption may be. Second, the ITR statistic is a deviation measure, although Fagan (1968), as noted, developed a method to convert ITR from a deviation to a ratio measure. The ITOV measure of subjective organization does not have these inherent deficiencies. Relative to Tulving's SO and Bousfield's ITR, it is computationally easy to obtain. It gives a ratio measure of shared variance and therefore chance values are not relevant. It assumes only linearity of regression (McNemar, 1962), and when the data are reduced to matrices, organization is linearity.

Analysis of the Langhorne replication of Tulving's study using the ITOV measure yielded some interesting results. The data for the Reverse High Organization and Low Organization groups are shown in Figure 1. Organization measured by ITOV increased systematically across trials and was substantially greater for the Reverse High Organization group, the group which had the superior recall performance. The initial difference in ITOV is to be expected in this experiment. Correlations between mean recall and mean ITOV were .68 for the Low Organization list and .72 for the Reverse High Organization list. This preliminary experiment provides evidence to support the contention that ITOV does in fact measure the development of organization across trials in multitrial free

Fig. 1.--Mean Recall and Mean ITOV for Reverse High Organization and Low Organization Lists.


Mean Recall
Mean ITOV
Trials
16
14
12
10
8
100
75
50
25
0
0
2
4
6
8
10
Reverse Recall
Lo Recall
Reverse ITOV
Lo ITOV

recall. Indeed the argument has been presented that this measure is not equivalent to the previous statistics, but superior.

Input Order

Waugh (1961) compared free recall performance where the input orders were constant or variable from trial to trial. She concluded that: "Free recall was not found to depend in any way on whether the words to be learned were scrambled before every trial or were presented in the same order on all trials" (p. 502). Waugh, herself, called this a "surprising outcome," as indeed it is. A reanalysis of her data by Beecroft and Langhorne showed that although total recall was similar for the two conditions over the six trials given, there were considerable differences in intertrial forgetting between the two lists. In the variable order condition items acquired on one trial were more likely to be forgotten on the succeeding trial. The amount of intertrial forgetting was less in this condition and eventually serial recall was superior to free recall. The intertrial forgetting curves for the constant order free recall more closely resembled serial recall than variable order free recall.

To follow up the observation of more intertrial forgetting with variable order presentation, Beecroft and Langhorne analyzed constant order and variable order free recall data obtained with a list of 40 words presented for four trials. There were 26 female subjects in each condition. There was much more intertrial forgetting in the variable order condition and the differences in intertrial forgetting became more pronounced later in training. This is in agreement with the reanalysis of Waugh's data. The second finding of importance was that despite poorer retention of words acquired on Trial 1, Trial 2 recall was better in the variable order condition. This is presumably due to items not recalled on Trial 1 moving into more favorable serial positions for recall on Trial 2. This effect tends to compensate for the greater degree of intertrial forgetting between Trials 1 and 2.

Jung and Skeebo (1967), in a careful study of constant and varied input in free recall, showed better constant order recall for both short and long lists. In an analysis of the serial position effects they found that items in the beginning of the list were recalled earlier with the constant input while in the varied input items from the end of the list were recalled first.

Wallace and Nappe (1970), in a previously cited study of subjective organization, specifically examined the effects of constant or variable inputs and fast (1 sec.) or slow (2 sec.) exposure rates on recall. Within exposure rates, the constant inputs always resulted in superior recall. In addition, a study examining the effects of test trials by Lachman and Laughery (1968) reported the incidental finding that constant-input groups showed superior performance to variable-input groups.

The weight of current evidence strongly points to the conclusion that constant-input orders in free recall produce better performance than variable-input lists. All of these studies, except the Beecroft-Langhorne experiment, have examined only the gross recall data and have not checked other indices such as the amount of intertrial forgetting. Fortunately, there exists a technique which is very suitable for examining such effects. In an interesting theoretical paper, Tulving (1964) suggested that when subjects are shown a list of words they in fact learn all of the words. He argued that if the presentation of a list of words is stopped at any time and the subject is asked to recall the last word presented, performance would be near perfect. If all items are "learned" when presented, the analysis of recall data can be regarded as the analysis of retention. Tulving proposes a trial-to-trial (TTT) analysis instead of the traditional trial-by-trial analysis. In Tulving"s TTT analysis the subject's protocol on two consecutive trials is divided into four mutually exclusive subsets: CC, CN, NC, and NN.

CC consists of items recalled on both Trial n-1 and Trial n. This subset Tulving refers to as intertrial retention.

NC consists of items not recalled on Trial n-1 but recalled on Trial n. This subset estimates intratrial retention.

CN is the subset of items recalled on Trial n-1 but not recalled on Trial n. This subset is called intertrial forgetting.

NN consists of items which are not recalled on either trial and is regarded as an estimate of intratrial forgetting.

The TTT analysis is performed on all consecutive pairs of trials yielding subsets which, when plotted against pairs of trials, give intertrial retention, intratrial retention, intertrial forgetting, and intratrial forgetting curves. It can be easily shown that the traditional performance curve is an additive function of the intertrial and intratrial retention curves:

$$\text{Recall} = CC + NC$$

Tulving used this TTT approach, which is essentially an analysis of contingent probabilities, as the basis for a mathematical theory of multi-trial free recall. He presented evidence obtained with a 22-word list to show that traditional recall is the sum of intertrial retention, which increases as a logarithmic function of trials, and intratrial retention, which remains constant over trials. He suggested that because intratrial retention is constant over trials, SO must be related only to intertrial retention. This is supported by substantial correlations between SO and CC. Although Tulving focuses primarily on the retention data, he does present the two forgetting curves from his study. The CN curve rises slightly for two trials and remains constant over the remaining trials. The NN curve appears to be a sharply decreasing geometric decay function. Another experiment by Tulving (1967) to check the model using a longer list (36 items) showed the CC curve to be a logarithmic function of trials. However, the NC function decreased linearly over trials. Tulving modified his theory to account for this result. Mayhew (1967), in the only other study in the literature using the TTT analysis, reported substantial correlations (.61 to .84) of CC with SO. However, the main thrust of this study was SO and he did not report any forgetting data.

These are the only studies that have used Tulving's TTT analysis of free recall data to date. This may be because Tulving views the TTT method as a theoretical model of verbal learning. If, instead, the TTT approach is viewed as a data-analytic model it becomes a powerful tool for examining empirical data. This is the use to which it will be put in the present study.

Proposal

This experiment is an analysis of the effects of input order on subjective organization and recall in a multitrial free recall paradigm. The subjects' ability to organize outputs when no organization is inherent in the input will be measured by a newly developed technique which seems to be more powerful than previous statistics. This is the intertrial organization variance (ITOV) measure. The recall data will be examined using the TTT analysis to determine differences in intertrial retention, intratrial retention, intertrial forgetting and intratrial forgetting due to input order. This analysis is particularly appropriate to this type of data.

The independent variables are constant or variable input order of the list and 16 free recall trials. The variable list inputs will be constructed such that across the 16 trials every item will be in every ordinal position only once and will be preceded and followed by every other item only once. The dependent variables are ITOV and the several performance measures resulting from a TTT analysis. Two experiments were carried out using female subjects. The second experiment is a replication of the first with the substitution of a new 16-item list.

CHAPTER II

METHOD

Subjects

The subjects were 84 female undergraduate students enrolled in introductory psychology. Subjects were voluntarily participating to fulfill a research requirement for the course. Their ages ranged from 17 to 23 with a mode of 18.

Apparatus

The stimuli were presented visually using a Kodak Carousel 800 slide projector controlled by a Gerbrands Model 1A programmer. The stimulus presentation time was 1.0 second with a 1.0 second blackout between each stimulus. Subjects were provided with paper and pencils to record their responses.

Procedure

Subjects participated in groups varying in size from six to 21 at evening times. The groups were randomly assigned to Experiment I or II and to constant or variable input order within each experiment. Experiment I employed the noon list and Experiment II the sculpture list (see Appendix A). The variable input orders were determined by a method Wagenaar (1969) developed such that across the 16 trials each stimulus is in each serial position only once and is preceded and followed by every other stimulus only once. This is called a digram-balanced Latin square (see Appendix B) and produces inputs with the minimum possible sequential dependency.

The two lists were chosen from a 40-word list developed for the Beecroft-Langhorne experiment on input order. Data from that experiment were used to select lists which would be similar in difficulty. The ordinal positions of the words in Appendix A are the Trial 1 inputs for both experiments. These were randomly assigned positions. The Trial 1 inputs are identical for both conditions within the experiment. These orders were the input on every trial in the constant-order condition while the position of each word in the variable inputs can be determined by noting the position of its number in the appropriate column of the Appendix B matrix. For example, the input order of the last trial is the reverse of the Trial 1 order.

Subjects were given the following instructions: This is a verbal learning task. Your job as a subject will be to try to learn the material you are shown to the best of your ability. I expect you to perform as well as you can every time the material is shown. If you feel that you cannot function in this capacity for the next hour, please indicate so now and you will not have to participate further.

In this experiment you are going to learn a list of words. Once we begin the experiment there is to be no communication whatsoever. Act as if you are the only subject in this experiment.

You will be shown a list of 16 words. They will appear one at a time on the screen. There will be a blank slide before the first item appears. After the first 16 words have been shown there will be another blank slide. At this time you will have one minute to write down the 16 items in any order you can remember them. Feel free to guess and please print. When the minute is up I will say stop. At this time, fold the page with the answers so you cannot see it (demonstrate). This procedure will be repeated throughout the experiment. Remember you can recall the items in any order you choose. Any questions?

The experiments were run in the standard multitrial free recall paradigm, with 60-second recall periods after each list presentation. Total time for each list was about 45 minutes and all the data were collected in six one-hour blocks.

CHAPTER III

RESULTS AND DISCUSSION

Data were collected on 84 subjects with four subjects being randomly discarded to bring the number in each group to 20. The data from each subject were transformed into a recall matrix. The following is an example of such a matrix for a subject in the constant order noon list (Experiment I):

Trials

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
noon	7	10	12	1	11	1	1	1	1	1	1	1	1	1	1	1
dollar	8	5	7	2	13	2	2	2	2	2	2	2	2	2	2	2
peach	-	11	2	3	-	3	3	3	3	3	3	3	3	3	3	3
flag	6	9	-	4	12	4	4	4	4	4	4	4	4	4	4	4
basket	5	6	-	9	1	5	5	5	5	5	5	5	5	5	5	5
denim	9	12	10	5	2	6	6	6	6	6	6	6	6	6	6	6
wine	-	-	1	-	3	9	7	7	7	7	7	7	7	7	7	7
tennis	-	-	13	13	-	-	-	11	11	8	8	8	8	8	8	8
radio	-	7	9	12	5	7	8	-	9	9	9	9	9	9	9	9
copper	-	-	8	10	4	8	10	9	8	10	10	10	10	10	10	10
lettuce	-	8	-	8	-	15	9	8	10	11	11	11	11	11	11	11
hammer	10	-	3	-	6	10	11	10	16	12	12	12	12	12	12	12
maple	1	1	11	6	7	11	12	12	12	13	13	13	13	13	13	13
salmon	2	2	4	-	9	13	13	13	14	14	14	14	14	14	14	14
garage	3	3	5	7	8	12	14	14	13	15	15	15	15	15	15	15
veal	4	4	6	11	10	14	15	15	15	16	16	16	16	16	16	16
Recall	10	12	13	13	13	15	15	15	16	16	16	16	16	16	16	16
ITOV		75	01	04	29	02	82	99	88	89	1.	1.	1.	1.	1.	1.
CC		9	9	10	10	13	15	14	15	16	16	16	16	16	16	16
NC		3	4	3	3	2	0	1	1	0	0	0	0	0	0	0
CN		1	3	3	3	0	0	1	0	0	0	0	0	0	0	0
NN		3	0	0	0	1	1	0	0	0	0	0	0	0	0	0

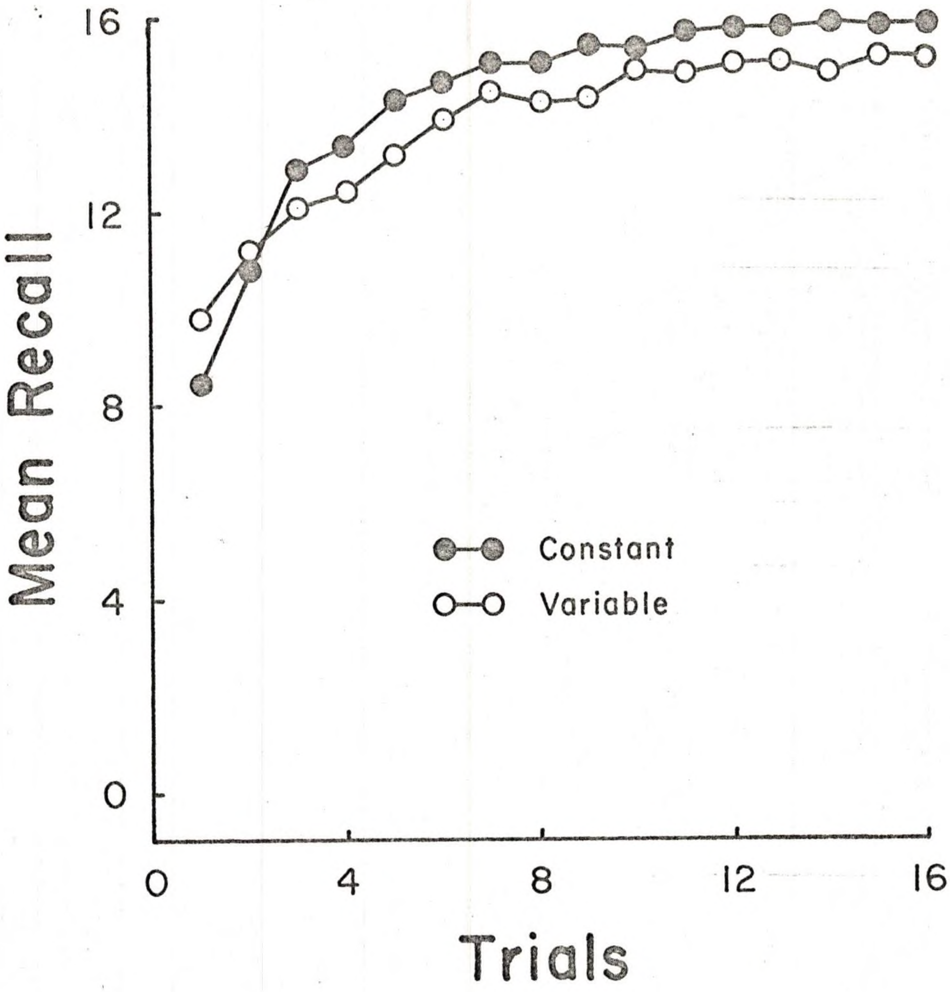
The rows are the items of the list and the columns are trials. The entry in a cell gives the ordinal position in which that word was recalled on that trial. The total recall on a trial can be determined by counting the number of entries in a column or by noting the magnitude of the last entry. The ITOV values were obtained by correlating the items common to every consecutive pair of trials and squaring the correlation. Thus, for each matrix there are 15 ITOV values. The TTT analysis is made similarly by noting pairs of outputs. Consider Trials 1 and 2: The items noon, dollar, flag, basket, denim, maple, salmon, garage and veal were recalled on both trials; intertrial retention (CC) is nine words. Peach, radio and lettuce comprise the intratrial retention (NC) score on the first pair of trials. The intertrial forgetting (CN) subset consists of the item hammer. Lastly, wine, tennis and copper contribute to the intratrial forgetting (NC) subset. This type of analysis is performed on every pair of trials for each subject.

The ITOV, Recall, CC and CN data are shown in Appendix D. It is possible to derive all the remaining data from these components. Means and standard deviations for all trials for all measures can be found in Appendix C.

The first analysis performed was on the recall data. The acquisition curves for Experiments I and II can be seen in Figures 2 and 3 and the corresponding repeated-measures analyses of variance in Tables 1 and 2.

Superior performance is seen in the constant order groups of both experiments, although the difference is larger for Experiment II.

Fig. 2.--Mean Recall for Experiment I.



16
12
8
4
0
Mean Recall
Constant
Variable
0
4
8
12
16
Trials

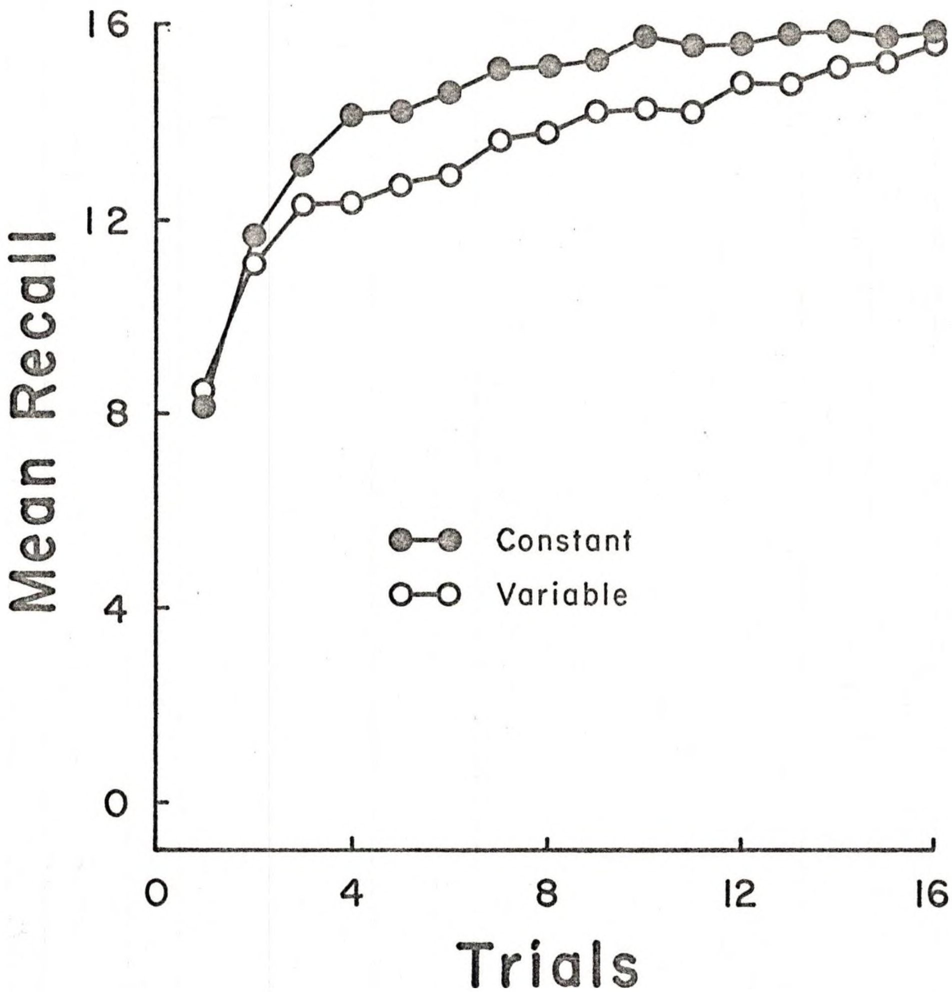

16
12
8
4
0
Mean Recall
Constant
Variable
0
4
8
12
16
Trials

TABLE 1

ANALYSIS OF VARIANCE SUMMARY TABLE FOR EXPERIMENT I RECALL DATA

Source	SS	df	MS	F	P
Between Subjects					
Input	60.02	1	60.02	3.70	-
error	616.37	38	16.22		
Within Subjects					
Trials	1951.90	15	130.12	98.57	<.001
Input x Trials	55.77	15	3.71	2.81	<.001
errors	751.82	570	1.32		

TABLE 2

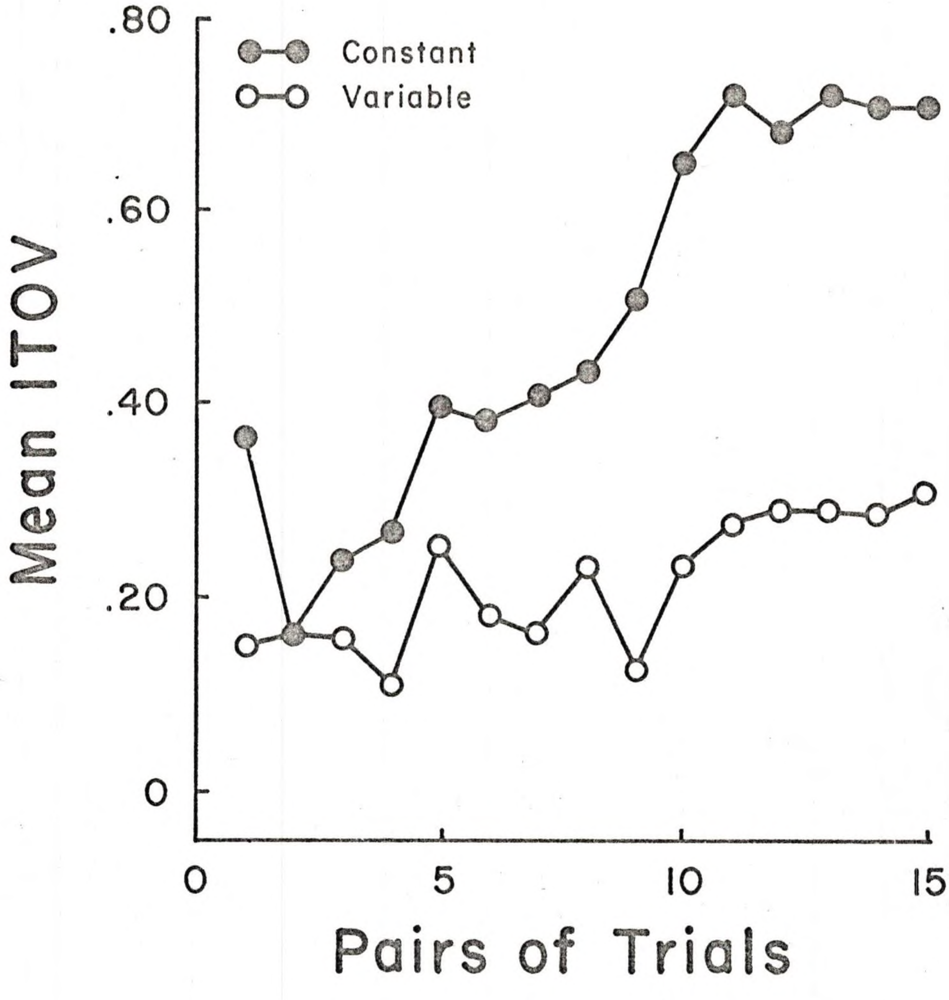
ANALYSIS OF VARIANCE SUMMARY TABLE FOR EXPERIMENT II RECALL DATA

Source	SS	df	MS	F	P
Between Subjects					
Input	185.98	1	185.98	25.51	<.001
error	277.27	38	7.29		
Within Subjects					
Trials	2145.03	15	143.00	115.32	<.001
Input x Trials	45.85	15	3.05	2.45	<.01
errors	704.67	570	1.24		

This is reflected in the significant effect of Input for the second experiment, F (1,38) = 25.51, p <.001; the Input mean square for Experiment I is non-significant. However, the significant I x T interactions of Experiment I, F (15,570) = 2.81, p <.001, and Experiment II, F (15,570) = 2.45, p <.01, reflect the fact that although recall for the variable input groups starts out slightly higher on the first trial, the curves promptly intersect and constant order recall is better thereafter. Since the Trial 1 orders are identical for the two groups, the initial recall differences favoring variable order input indicate that the variable order subjects were somewhat superior in memorizing ability. It should also be noted that the subjects in Experiment I were more variable than subjects in Experiment II so far as the total number of words recalled for all trials; this is shown in the greater between-subject error variances in Experiment I compared to Experiment II. The within-subjects error terms are quite comparable for the two experiments in all analyses, which indicates the learning curves for individual subjects are as smooth in one experiment as the other; there is simply more vertical range in the curves of Experiment I.

Figures 4 and 5 show the ITOV data for the two experiments. Tables 3 and 4 present the statistical analyses. Two features stand out. First, the mean ITOV is much higher for the constant-order groups; this effect is highly significant ($p < .001$) in both experiments. Second, the margin of constant order superiority in ITOV increases across trials; the interactions are statistically significant. The increase in organization across trials, as measured by ITOV, is quite modest in the variable order conditions.

The two acquisition components, CC and NC, were then analyzed. Figures 6 and 7 show the CC component of the two experiments and Tables 5 and 6 summarize the appropriate analyses. In both experiments the intertrial retention is clearly higher for the constant input groups. The difference is somewhat smaller in Experiment I



.80
.60
.40
.20
0
Constant
Variable
Mean ITOV
0
5
10
15
Pairs of Trials

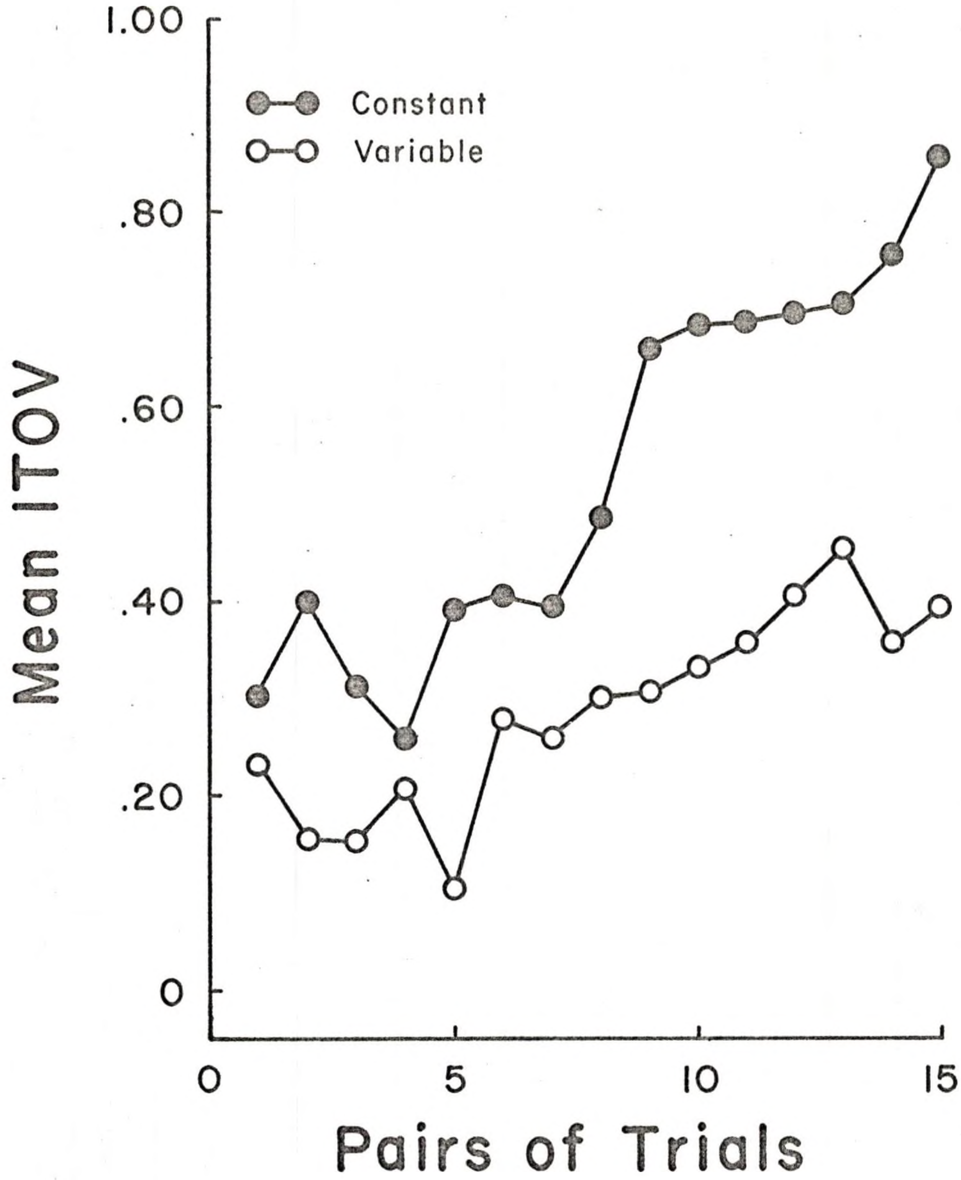

1.00
.80
.60
.40
.20
0
Constant
Variable
Mean ITOV
0
5
10
15
Pairs of Trials

TABLE 3

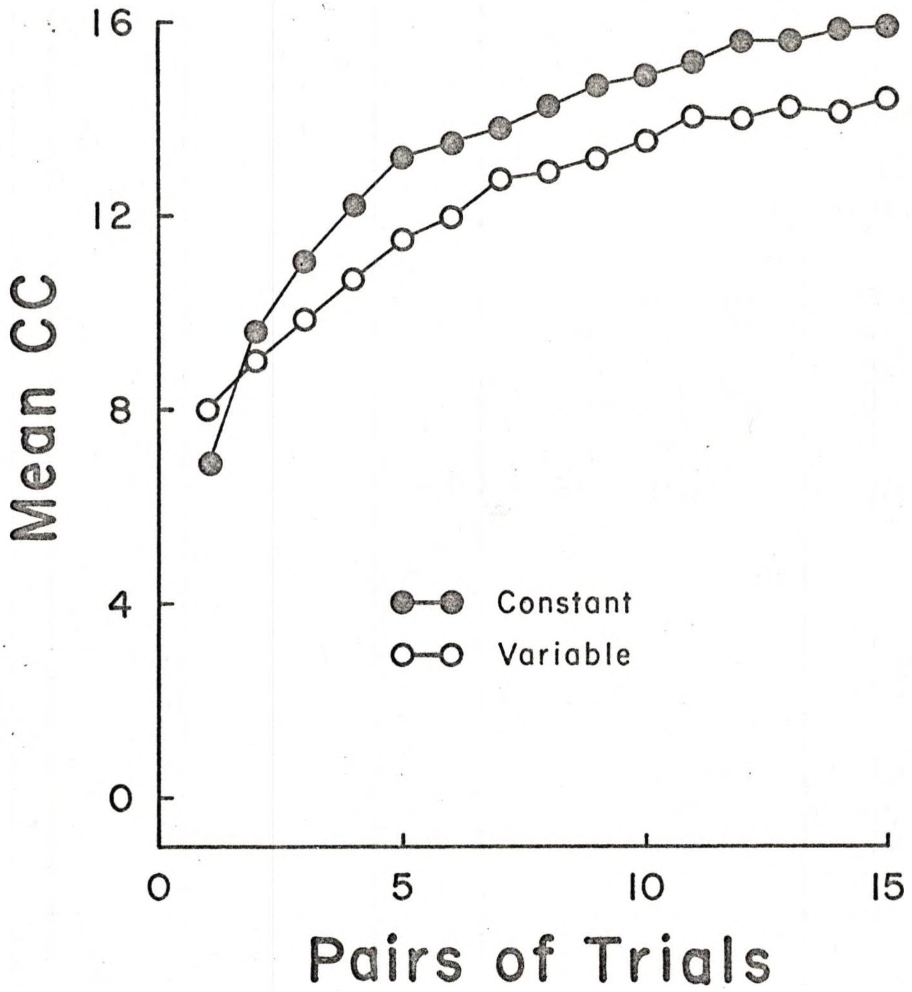
ANALYSIS OF VARIANCE SUMMARY TABLE FOR EXPERIMENT I ITOV DATA

Source	SS	df	MS	F	P
Between Subjects					
Input	8.87	1	8.87	13.23	<.001
error	25.56	38	0.67		
Within Subjects					
Trials	11.18	14	0.798	11.56	<.001
Input x Trials	2.08	14	0.148	2.14	<.01
errors	37.19	532	0.069		

TABLE 4

ANALYSIS OF VARIANCE SUMMARY TABLE FOR EXPERIMENT II ITOV DATA

Source	SS	df	MS	F	P
Between Subjects					
Input	11.46	1	11.46	25.46	<.001
error	17.01	38	0.447		
Within Subjects					
Trials	8.76	14	0.626	10.43	<.001
Input x Trials	3.04	14	0.217	3.61	<.001
error	32.26	532	0.060		


16
12
8
4
0
Mean CC
Constant
Variable
0
5
10
15
Pairs of Trials

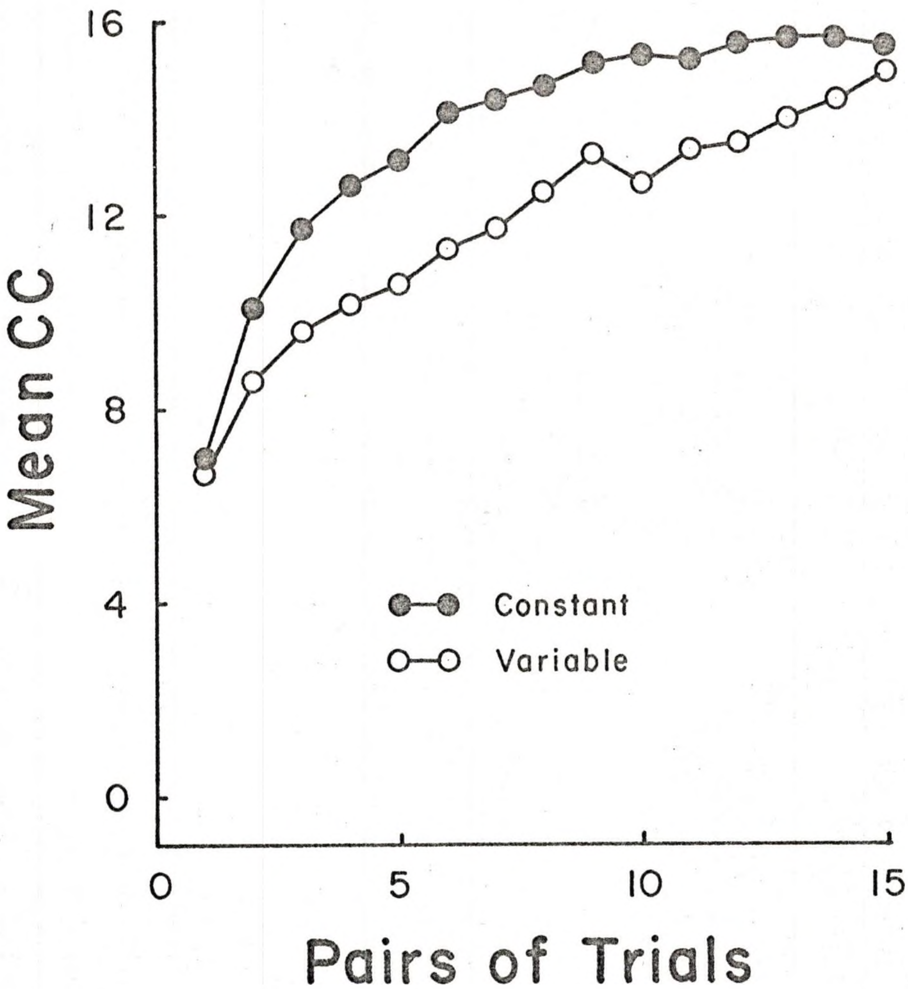

16
12
8
4
0
Mean CC
Constant
Variable
0
5
10
15
Pairs of Trials

TABLE 5

ANALYSIS OF VARIANCE SUMMARY TABLE FOR EXPERIMENT I CC DATA

Source	SS	df	MS	F	P
Between Subjects					
Input	206.51	1	206.51	5.48	<.05
error	1432.02	38	37.68		
Within Subjects					
Trials	3079.23	14	219.94	107.28	<.001
Input x Trials	84.29	14	6.02	2.93	<.001
error	1093.26	532	2.05		

TABLE 6

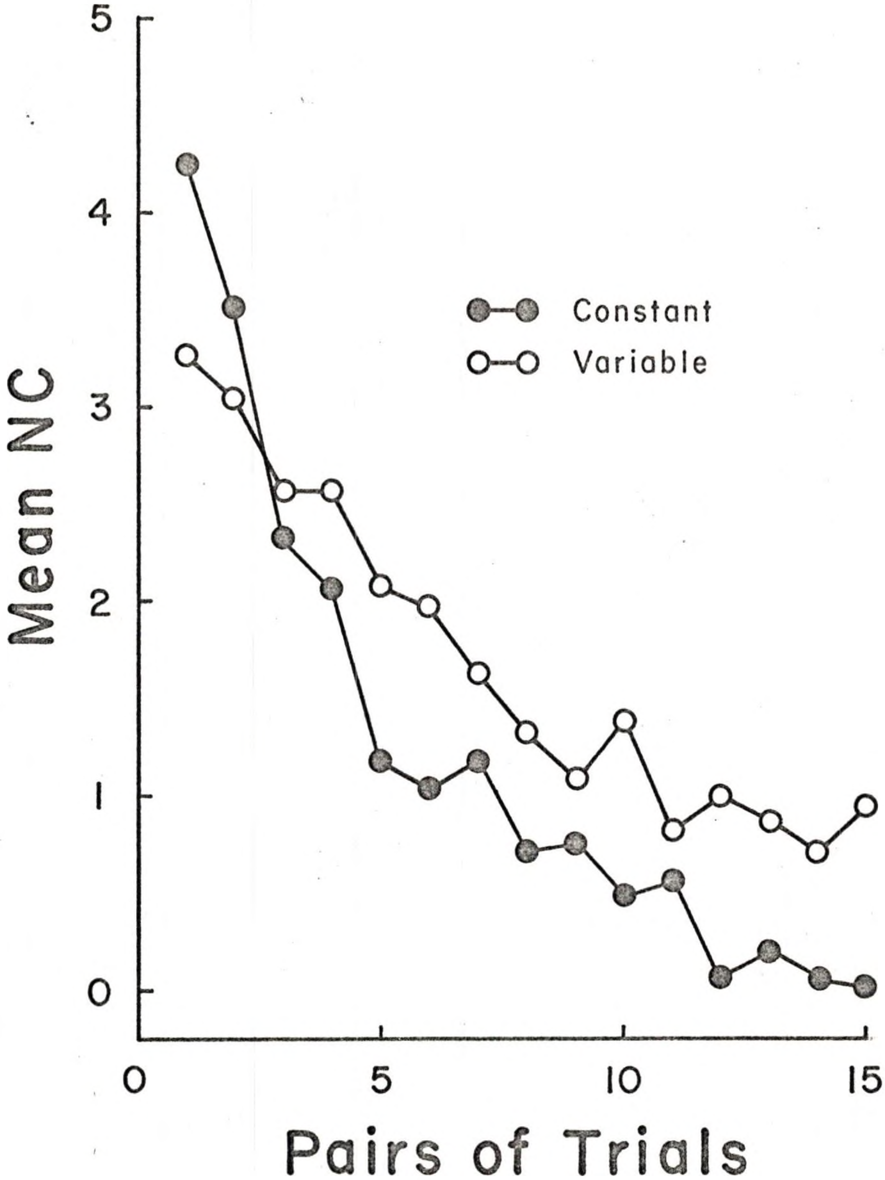
ANALYSIS OF VARIANCE SUMMARY TABLE FOR EXPERIMENT II CC DATA

Source	SS	df	MS	F	P
Between Subjects					
Input	556.81	1	556.81	34.09	<.001
error	620.67	38	16.33		
Within Subjects					
Trials	3184.90	14	227.49	133.03	<.001
Input x Trials	80.94	14	5.78	3.38	<.001
error	911.20	532	1.71		

and the corresponding level of significance somewhat less. The interactions for both experiments are significant at less than the .001 level. In Experiment I this interaction results from a lower intertrial retention on the first pair of trials and then rapid gain on the second pair of trials for the constant order groups. The two conditions start together, diverge throughout most of the trials and then converge in the last several trials in Experiment II.

For the second component of the recall, the NC subset, Figures 8 and 9 and Tables 7 and 8 present some interesting pictures. These data are the items which were not recalled on Trial n-1 but were recalled on Trial n. In both experiments the interactions are significant, $F(14,532) = 2.81$, $p < .001$ and $F(14,532) = 2.37$, $p < .01$. The constant input NC curves start higher and drop quite rapidly to near zero while the variable groups decrease more slowly and do not approach zero after 15 pairs of trials. Throughout most of the learning, the mean NC scores are lower for the constant order groups.

The forgetting data were then obtained and analyzed. Forgetting curves would simply be the compliments of the recall curves. The CN and NN data are the components of such a curve. The intertrial forgetting data are shown in Figures 10 and 11 with their associated analyses in Tables 9 and 10. Intertrial forgetting is the subset of items that are recalled on Trial n-1 and lost on Trial n. These results are perhaps the most interesting of all the TTT analyses. While the main effects of input order are significant, both of the interactions are nonsignificant; hence, the constant and variable input curves in each experiment are very similar in shape. Although their shapes are



Constant
Variable
Mean NC
5
4
3
2
1
0
0
5
10
15
Pairs of Trials

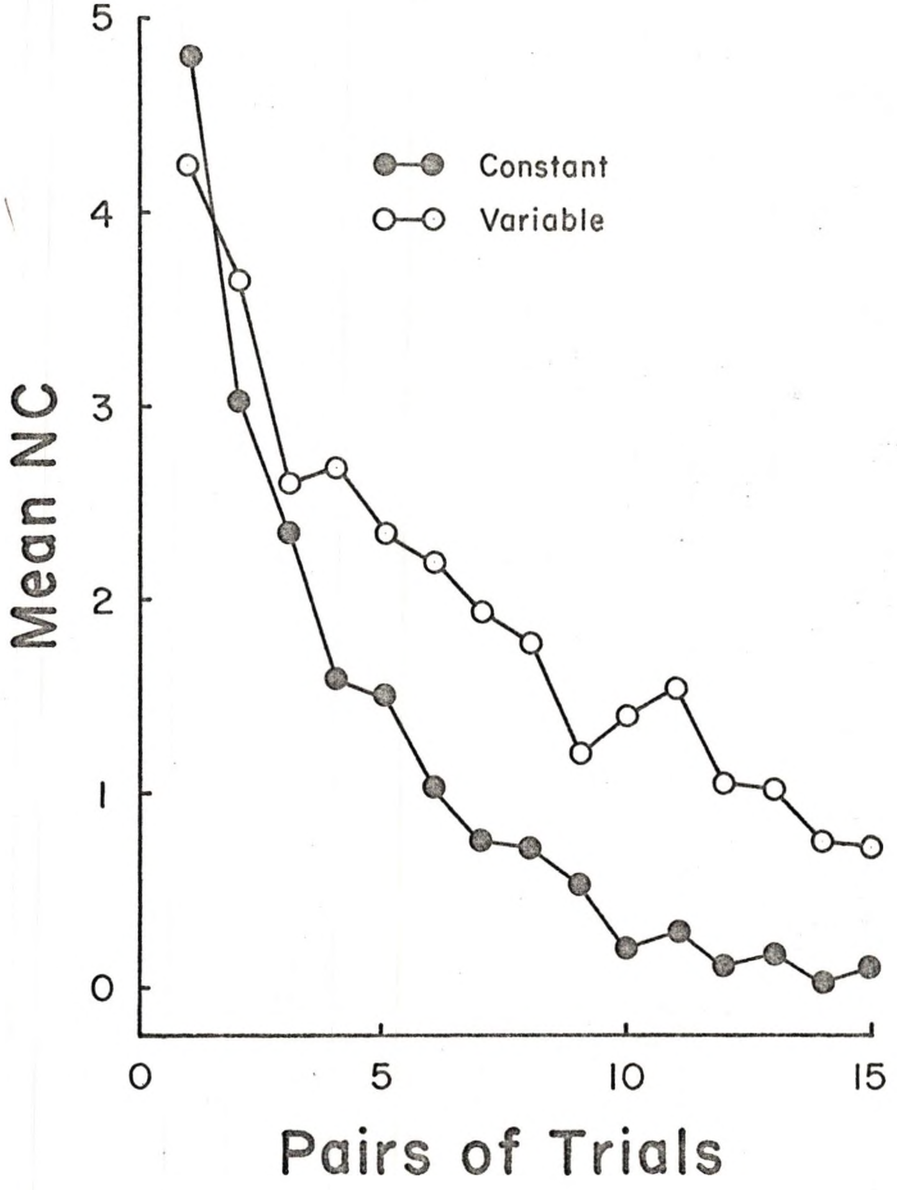

Constant
Variable
Mean NC
0
1
2
3
4
5
0
5
10
15
Pairs of Trials

TABLE 7

ANALYSIS OF VARIANCE SUMMARY TABLE FOR EXPERIMENT I NC DATA

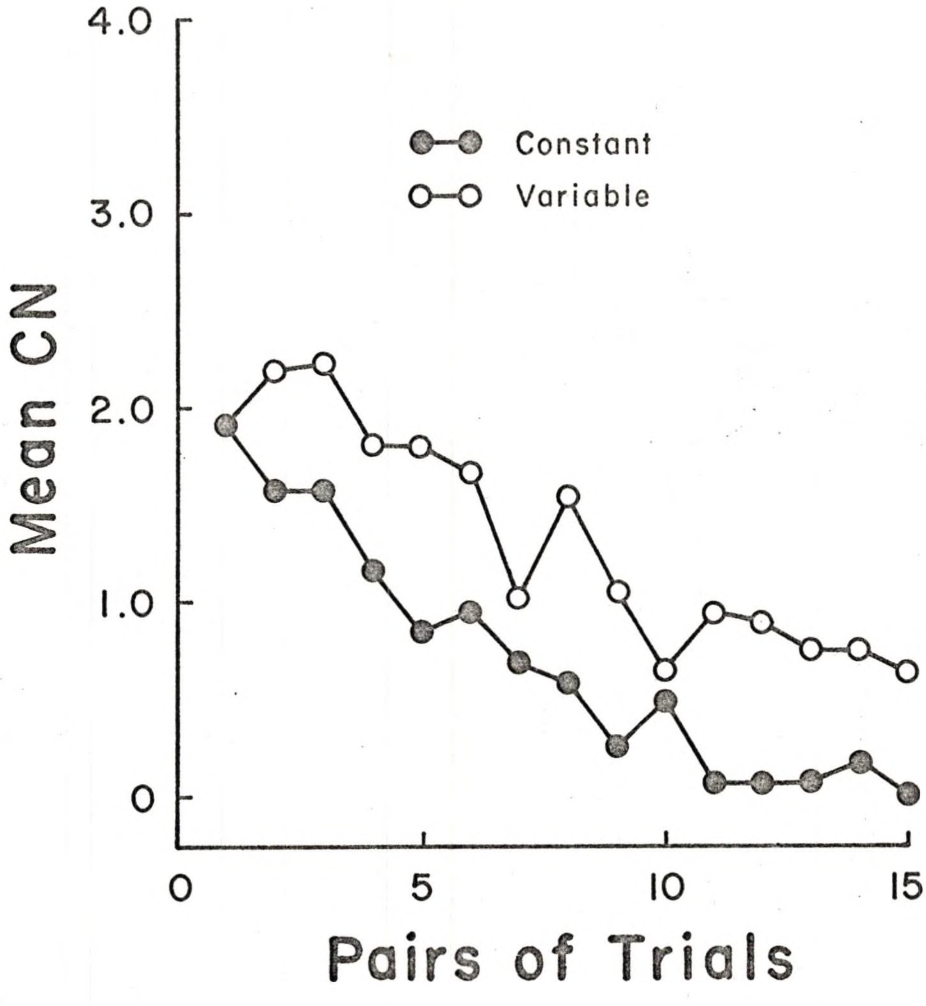
Source	SS	df	MS	F	P
Between Subjects					
Input	28.60	1	28.60	5.00	<.05
error	217.44	38	5.72		
Within Subjects					
Trials	631.24	14	45.09	45.67	<.001
Input x Trials	39.12	14	2.79	2.81	<.001
error	525.10	532	0.987		

TABLE 8

ANALYSIS OF VARIANCE SUMMARY TABLE FOR EXPERIMENT II NC DATA

Source	SS	df	MS	F	P
Between Subjects					
Input	92.04	1	92.04	37.41	<.001
error	93.61	38	2.46		
Within Subjects					
Trials	770.71	14	55.05	59.19	<.001
Input x Trials	30.88	14	2.21	2.37	<.01
error	492.93	532	0.926		

Fig. 10.--Mean Intertrial Forgetting for Experiment I.


4.0
3.0
2.0
1.0
0
Mean CN
Constant
Variable
0
5
10
15
Pairs of Trials

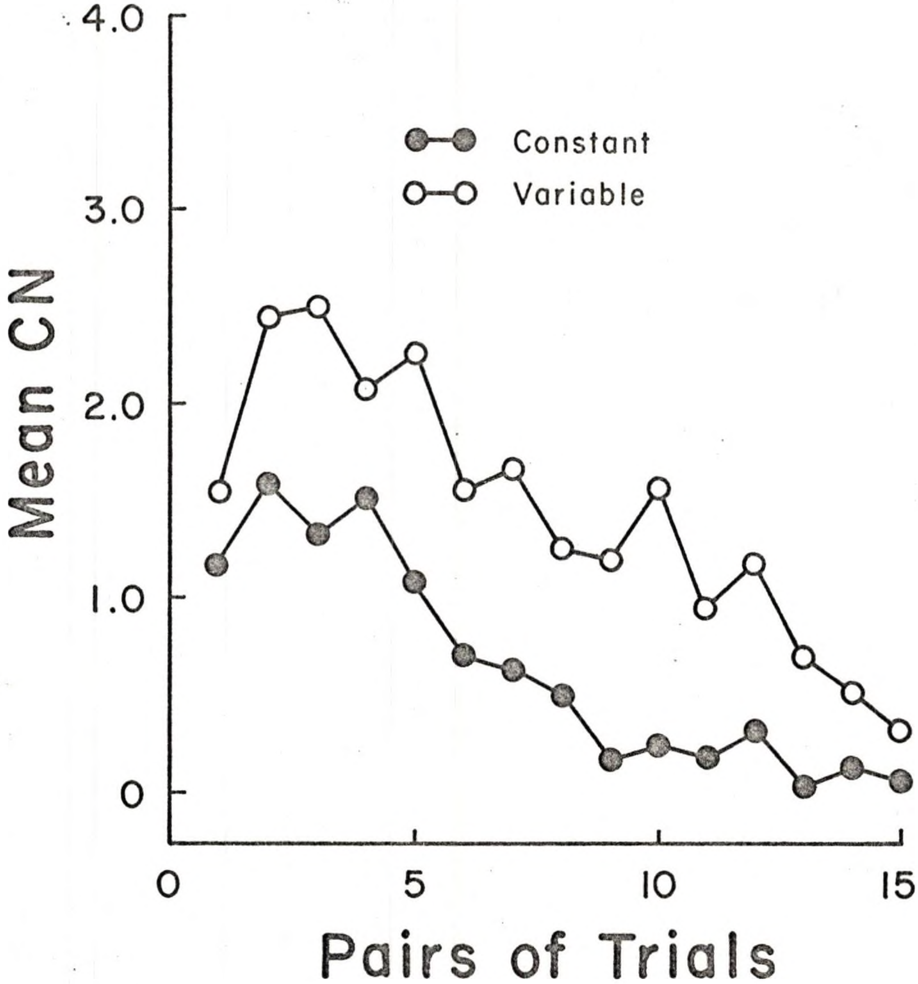

4.0
3.0
2.0
1.0
0
Mean CN
Constant
Variable
0
5
10
15
Pairs of Trials

TABLE 9

ANALYSIS OF VARIANCE SUMMARY TABLE FOR EXPERIMENT I CN DATA

Source	SS	df	MS	F	P
Between Subjects					
Input	48.17	1	48.17	9.35	<.01
error	195.70	38	5.15		
Within Subjects					
Trials	200.11	14	14.29	15.70	<.001
Input x Trials	8.78	14	0.627		
error	482.30	532	0.906		

TABLE 10

ANALYSIS OF VARIANCE SUMMARY TABLE FOR EXPERIMENT II CN DATA

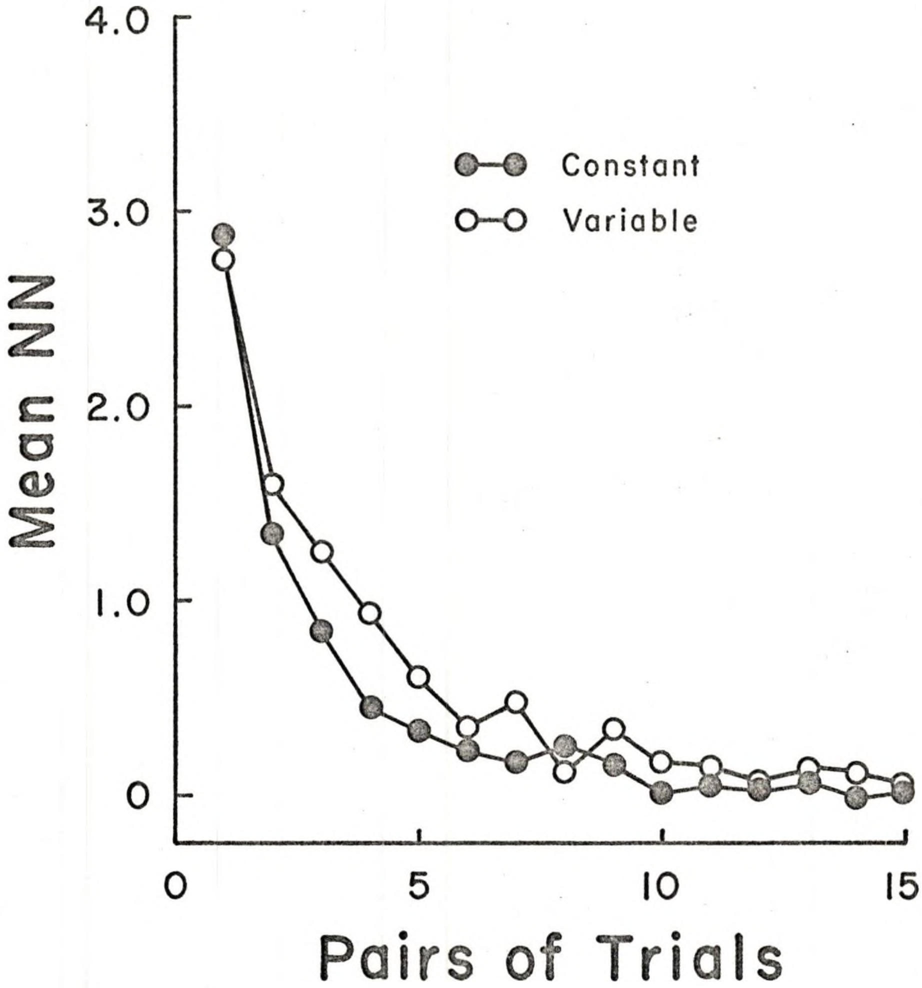
Source	SS	df	MS	F	P
Between Subjects					
Input	91.26	1	91.26	42.64	<.001
error	81.43	38	2.14		
Within Subjects					
Trials	206.16	14	14.73	17.95	<.001
Input x Trials	15.04	14	1.07	1.30	
error	436.25	532	0.82		

similar, the constant input groups quickly decrease toward zero while the variable input data shows considerably more intertrial forgetting. The amount of intertrial forgetting appears to increase for several trials, at least in the variable order condition.

The final set of data in the TTT analysis is the NN results. These are presented in Figures 12 and 13 with appropriate statistical treatment in Tables 11 and 12. Neither the input main effects nor the interactions are significant in Experiment I. However, Experiment II shows a significant input difference, $F(1,38) = 8.63$, $p < .001$, the variable input condition showing more intratrial forgetting.

The recall data for both experiments offer convincing evidence to support findings in the literature that constant versus variable order of input has substantial effects on subjects' ability to learn lists of words. The input order is identical for both groups on the first trial because variable orders cannot appear until the second trial. The recall is very similar for both groups on the second trial, presumably because the movement of new items into favorable serial positions helps maintain performance of the variable order group. However, the effects of the constant order input begin to make themselves felt on the third trial and all trials thereafter.

Analysis of ITOV showed that the subjects who were in the constant input groups organized the data more quickly and to a much higher degree than the variable input groups. Both conditions exhibited improvement in ITOV as trials progressed, although the increase in organization was much more dramatic for the constant input groups. Mean ITOV and Mean CC were correlated for all four



4.0
3.0
2.0
1.0
0
Mean NN
Constant
Variable
0
5
10
15
Pairs of Trials

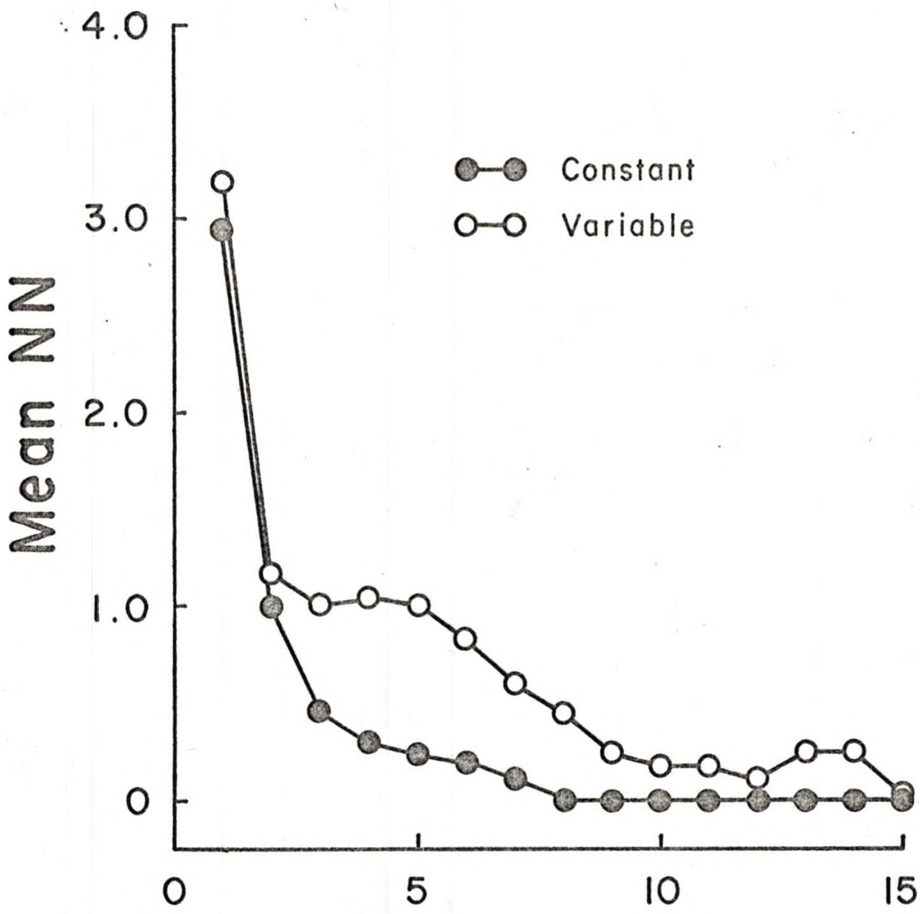

Constant
Variable
4.0
3.0
2.0
1.0
0
Mean NN
0
5
10
15
Pairs of Trials

TABLE 11

ANALYSIS OF VARIANCE SUMMARY TABLE FOR EXPERIMENT I NN DATA

Source	SS	df	MS	F	P
Between Subjects					
Input	4.51	1	4.51	1.19	-
error	143.20	38	3.76		
Within Subjects					
Trials	342.12	14	24.44	38.77	<.001
Input x Trials	5.04	14	0.36		
error	333.90	532	0.627		

TABLE 12

ANALYSIS OF VARIANCE SUMMARY TABLE FOR EXPERIMENT II NN DATA

Source	SS	df	MS	F	P
Between Subjects					
Input	19.08	1	19.08	8.63	<.01
error	84.24	38	2.21		
Within Subjects					
Trials	337.61	14	24.11	53.57	<.001
Input x Trials	7.84	14	0.56	1.25	
error	238.01	532	0.447		

groups. The correlations were .78 and .74 for the constant order subjects in the two experiments and .79 and .59 for the variable order subjects. These correlations are comparable to those obtained by Tulving and others using the SO and ITR measures. They suggest a dependency between organization and intertrial retention.

An analysis of the organizational-performance relationship of individual subjects can best be done on the last trials when organization should be maximal. It is possible to check on the relationship between input and organization by determining the number of subjects in each condition who have ITOV scores of 1.00 for the last pair of trials. Of the 40 variable input subjects, only two have perfectly organized their outputs by the last pair of trials while 20 of the 40 constant input subjects show complete organization. A further analysis of these subjects was made to determine the relationship between input and output on the 16th trial. Eighteen of the subjects in the constant order conditions gave outputs identical to the 16th trial input. None of the subjects in the variable order condition had outputs identical to inputs. The better performance of the constant input subjects is associated with serial organization of the input. There was no systematic relationship between input and output in the variable input groups.

The intertrial retention data are very similar to the recall data showing similar CC performance for the first pair of trials with the effects of input orders beginning to appear on the second pair of trials. The differences in CC are larger than recall differences. Examination of the second component of recall, NC, is more interesting.

The NC data reflect new items coming in on the first pair of trials. On all later pairs of trials it is a composite of new items and items forgotten on the first of the two trials. The constant input NC curves decrease more rapidly than the variable input NC curves which remain fairly high even in the last pair. These curves of intratrial retention differ markedly from those Tulving (1964) presented to support his theory. With lists of length 22 and 36 items Tulving obtained NC functions which were linear with either a zero slope or a slight negative slope. The curves obtained in the present experiments are definitely not linear and their slopes are non-zero. Apparently the slope of the NC function is related to the length of the list, becoming steeper and less linear with shorter lists.

The last two analyses are the forgetting components, intertrial forgetting and intratrial forgetting. Three of the four CN curves show increases in intertrial forgetting on the second and third pairs of trials followed by a decrease in forgetting throughout the rest of the trials. As new items are recalled on the first few trials, some of these are quickly lost and the loss is greater for the variable input groups. These results are also dissimilar to those of Tulving. An intertrial forgetting curve obtained by Tulving increased on the first few pairs of trials and remained constant throughout the trials. The intratrial forgetting data is similar to Tulving's, showing a rapid decrease across the first several trials and thereafter a moderate decrease to an asymptote of zero.

The results of this study offer convincing evidence that the difference in free recall between subjects given constant or variable input orders is a highly interpretable one. Every one of the five dependent variables (ITOV, CC, NC, CN, and NN) examined was found to be affected by input order and to relate in meaningful ways to the gross differences in recall associated with input order. Thus, both the ITOV measure of organization and Tulving's TTT analysis have proven to be useful analytical tools in examining the effect of an important variable, order of presentation. Similar applications would prove useful in considering meaningfulness, intralist similarity, and other variables of demonstrated effect in verbal learning.

APPENDIX A

Stimulus Lists

Experiment I

1. noon
2. dollar
3. peach
4. flag
5. basket
6. denim
7. wine
8. tennis
9. radio
10. copper
11. lettuce
12. hammer
13. maple
14. salmon
15. garage
16. veal

Experiment II

1. sculpture
2. oboe
3. polka
4. creek
5. geology
6. emerald
7. pipe
8. daisy
9. salt
10. fork
11. rain
12. haystack
13. willow
14. tenor
15. baker
16. library

APPENDIX B

16 x 16 Balanced Diagram Latin Square

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
2	13	16	11	14	9	12	10	7	5	8	3	6	1	4	15
3	16	5	2	7	4	8	6	11	9	13	10	15	12	1	14
4	11	2	9	16	10	14	12	5	3	7	1	8	15	6	13
5	14	7	16	8	2	6	4	13	11	15	9	1	10	3	12
6	9	4	10	2	12	16	14	3	1	5	15	7	13	8	11
7	12	8	14	6	16	4	2	15	13	1	11	3	9	5	10
8	10	6	12	4	14	2	16	1	15	3	13	5	11	7	9
9	7	11	5	13	3	15	1	16	2	14	4	12	6	10	8
10	5	9	3	11	1	13	15	2	4	16	6	14	8	12	7
11	8	13	7	15	5	1	3	14	16	12	2	10	4	9	6
12	3	10	1	9	15	11	13	4	6	2	8	16	7	14	5
13	6	15	8	1	7	3	5	12	14	10	16	9	2	11	4
14	1	12	15	10	13	9	11	6	8	4	7	2	5	16	3
15	4	1	6	3	8	5	7	10	12	9	14	11	16	13	2
16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1

APPENDIX C

TABLE 13

MEANS AND STANDARD DEVIATIONS OF RECALL DATA

Constant			Variable		
Trial	Mean	Standard Deviation	Trial	Mean	Standard Deviation
		Experiment I			
1	8.50	2.06	1	9.80	2.09
2	10.95	2.41	2	11.25	1.91
3	12.90	1.51	3	12.05	1.98
4	13.35	1.56	4	12.45	1.87
5	14.30	1.68	5	13.25	1.58
6	14.55	1.90	6	13.60	1.72
7	14.55	1.27	7	13.90	1.58
8	15.00	1.21	8	14.45	1.43
9	15.00	1.21	9	14.25	1.83
10	15.40	1.09	10	14.30	1.75
11	15.35	1.08	11	14.95	1.27
12	15.75	0.44	12	14.85	1.26
13	15.80	0.52	13	15.00	1.29
14	15.80	0.52	14	15.10	1.48
15	15.95	0.22	15	14.90	1.55
16	15.95	0.22	16	15.20	1.15
		Experiment II			
1	8.20	1.47	1	8.55	1.53
2	11.75	1.58	2	11.10	1.68
3	13.15	1.59	3	12.30	1.34
4	14.15	1.18	4	12.30	1.34
5	14.25	1.06	5	12.80	1.36
6	14.70	1.03	6	12.95	1.84
7	15.10	1.16	7	13.60	1.42
8	15.20	1.05	8	13.75	1.11
9	15.40	0.94	9	14.35	1.46
10	15.80	0.52	10	14.35	1.18
11	15.60	0.68	11	14.15	1.46
12	15.65	0.93	12	14.75	1.33
13	15.80	0.52	13	14.65	1.22
14	15.95	0.22	14	15.05	1.09
15	15.80	0.52	15	15.25	0.71
16	15.85	0.36	16	15.20	2.66

TABLE 14

MEANS AND STANDARD DEVIATIONS OF ITOV DATA

Constant			Variable		
Trial	Mean	Standard Deviation	Trial	Mean	Standard Deviation
		Experiment I			
1	0.31	0.29	1	0.23	0.23
2	0.40	0.29	2	0.15	0.20
3	0.32	0.26	3	0.15	0.17
4	0.26	0.26	4	0.21	0.21
5	0.38	0.30	5	0.10	0.12
6	0.40	0.35	6	0.28	0.29
7	0.39	0.38	7	0.26	0.28
8	0.47	0.33	8	0.30	0.35
9	0.66	0.37	9	0.31	0.36
10	0.68	0.37	10	0.33	0.36
11	0.68	0.40	11	0.36	0.38
12	0.69	0.37	12	0.41	0.41
13	0.70	0.42	13	0.46	0.40
14	0.75	0.37	14	0.35	0.39
15	0.85	0.23	15	0.39	0.39
		Experiment II			
1	0.37	0.32	1	0.15	0.18
2	0.15	0.17	2	0.16	0.16
3	0.23	0.24	3	0.16	0.19
4	0.27	0.25	4	0.11	0.11
5	0.39	0.30	5	0.25	0.28
6	0.39	0.32	6	0.18	0.24
7	0.41	0.36	7	0.17	0.25
8	0.43	0.42	8	0.23	0.24
9	0.51	0.41	9	0.12	0.17
10	0.65	0.37	10	0.23	0.24
11	0.73	0.32	11	0.27	0.21
12	0.67	0.35	12	0.28	0.31
13	0.73	0.37	13	0.28	0.27
14	0.71	0.37	14	0.28	0.23
15	0.70	0.38	15	0.31	0.30

TABLE 15

MEANS AND STANDARD DEVIATIONS OF CC DATA

Constant			Variable		
Trial	Mean	Standard Deviation	Trial	Mean	Standard Deviation
		Experiment I			
1	6.60	2.39	1	7.95	2.21
2	9.45	2.30	2	9.00	2.31
3	11.05	2.03	3	9.85	2.75
4	12.15	2.45	4	10.65	2.36
5	13.35	2.30	5	11.50	2.32
6	13.50	2.32	6	11.95	2.52
7	13.80	1.88	7	12.85	2.39
8	14.30	1.71	8	12.95	2.83
9	14.65	1.66	9	13.15	2.68
10	14.85	1.84	10	13.55	2.54
11	15.15	1.18	11	14.05	1.76
12	15.65	0.58	12	14.00	2.12
13	15.60	0.75	13	14.25	2.14
14	15.80	0.61	14	14.20	2.39
15	15.90	0.30	15	14.30	2.20
		Experiment II			
1	6.95	1.31	1	6.85	1.59
2	10.10	1.80	2	8.65	1.89
3	11.80	2.04	3	9.70	1.97
4	12.65	1.38	4	10.10	2.02
5	13.20	1.54	5	10.60	2.01
6	14.05	1.57	6	11.40	2.18
7	14.45	1.60	7	11.85	1.98
8	14.70	1.38	8	12.55	2.01
9	15.20	1.28	9	13.15	2.03
10	15.40	1.04	10	12.75	2.17
11	15.35	1.08	11	13.20	2.09
12	15.70	0.65	12	13.55	2.08
13	15.75	0.71	13	14.00	1.77
14	15.75	0.55	14	14.50	1.43
15	15.70	0.65	15	15.00	0.91

TABLE 16

MEANS AND STANDARD DEVIATIONS OF NC DATA

Constant			Variable		
Trial	Mean	Standard Deviation	Trial	Mean	Standard Deviation
		Experiment I			
1	4.35	1.22	1	3.35	1.13
2	3.45	1.60	2	3.05	1.50
3	2.30	0.97	3	2.60	1.39
4	2.15	1.30	4	2.60	1.35
5	1.20	0.95	5	2.10	1.41
6	1.05	1.31	6	1.95	1.35
7	1.20	1.00	7	1.60	1.35
8	0.70	0.80	8	1.30	1.21
9	0.75	0.91	9	1.15	1.26
10	0.50	0.88	10	1.40	1.53
11	0.60	0.99	11	0.80	1.00
12	0.15	0.36	12	1.00	1.16
13	0.20	0.52	13	0.85	1.03
14	0.15	0.48	14	0.70	1.03
15	0.05	0.22	15	0.90	1.33
		Experiment II			
1	4.80	1.19	1	4.25	0.91
2	3.05	1.14	2	3.65	1.26
3	2.35	1.30	3	2.60	1.39
4	1.60	1.09	4	2.70	1.03
5	1.50	1.00	5	2.35	1.34
6	1.05	0.94	6	2.20	1.36
7	0.75	1.01	7	1.90	1.41
8	0.70	0.92	8	1.80	0.89
9	0.60	0.94	9	1.20	1.10
10	0.20	0.52	10	1.40	1.04
11	0.30	0.57	11	1.55	1.05
12	0.15	0.36	12	1.10	1.25
13	0.20	0.52	13	1.05	0.99
14	0.05	0.22	14	0.75	0.96
15	0.15	0.48	15	0.70	0.65

TABLE 17

MEANS AND STANDARD DEVIATIONS OF CN DATA

Constant			Variable		
Trial	Mean	Standard Deviation	Trial	Mean	Standard Deviation
		Experiment I			
1	1.90	1.55	1	1.90	1.33
2	1.70	0.97	2	2.30	1.41
3	1.80	0.95	3	2.25	1.61
4	1.20	1.23	4	1.85	1.22
5	0.95	1.19	5	1.85	1.22
6	1.10	0.96	6	1.65	1.38
7	0.80	0.89	7	1.05	1.14
8	0.75	0.85	8	1.55	1.60
9	0.40	0.82	9	1.10	1.29
10	0.55	0.88	10	0.75	0.91
11	0.20	0.41	11	0.90	0.96
12	0.15	0.36	12	0.85	1.13
13	0.20	0.52	13	0.75	1.11
14	0.05	0.22	14	0.90	1.25
15	0.05	0.22	15	0.65	1.03
		Experiment II			
1	1.25	0.85	1	1.70	0.97
2	1.80	1.00	2	2.45	1.35
3	1.40	1.14	3	2.50	1.19
4	1.50	1.00	4	2.15	1.22
5	1.05	0.94	5	2.20	1.43
6	0.70	1.03	6	1.60	1.14
7	0.65	0.93	7	1.70	1.03
8	0.50	0.82	8	1.20	1.10
9	0.20	0.52	9	1.20	1.05
10	0.40	0.68	10	1.65	1.30
11	0.35	0.93	11	0.95	0.94
12	0.15	0.36	12	1.20	1.10
13	0.05	0.22	13	0.75	0.85
14	0.20	0.52	14	0.55	0.51
15	0.15	0.36	15	0.25	0.44

TABLE 18

MEANS AND STANDARD DEVIATIONS OF NN DATA

Constant			Variable		
Trial	Mean	Standard Deviation	Trial	Mean	Standard Deviation
			Experiment I		
1	3.15	2.49	1	2.85	1.63
2	1.40	1.57	2	1.65	1.59
3	0.85	1.14	3	1.30	1.08
4	0.50	0.76	4	0.90	1.02
5	0.50	1.00	5	0.55	0.94
6	0.35	0.93	6	0.45	0.60
7	0.20	0.52	7	0.50	0.60
8	0.25	0.55	8	0.20	0.41
9	0.20	0.52	9	0.60	0.82
10	0.10	0.31	10	0.30	0.57
11	0.05	0.22	11	0.25	0.55
12	0.05	0.22	12	0.15	0.48
13	0.00	0.00	13	0.15	0.48
14	0.00	0.00	14	0.20	0.69
15	0.00	0.00	15	0.15	0.36
			Experiment II		
1	3.00	1.65	1	3.20	1.58
2	1.05	1.32	2	1.25	1.33
3	0.45	0.60	3	1.20	1.00
4	0.25	0.44	4	1.05	0.94
5	0.25	0.44	5	0.85	0.99
6	0.20	0.52	6	0.80	0.95
7	0.15	0.37	7	0.55	0.89
8	0.15	0.31	8	0.45	0.76
9	0.00	0.00	9	0.45	0.83
10	0.00	0.00	10	0.20	0.41
11	0.00	0.00	11	0.30	0.67
12	0.05	0.22	12	0.15	0.37
13	0.00	0.00	13	0.20	0.41
14	0.00	0.00	14	0.15	0.37
15	0.00	0.00	15	0.05	0.22

APPENDIX D

TABLE 19

EXPERIMENT I RECALL DATA

Constant Input		Trials															
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Subjects	1	3	7	8	8	10	8	11	12	11	13	14	15	16	16	16	16
	2	10	12	13	13	13	15	15	15	16	16	16	16	16	16	16	16
	3	8	10	11	12	15	14	15	15	15	16	15	15	16	16	16	16
	4	6	8	13	13	15	16	15	14	16	16	16	16	15	16	16	16
	5	9	12	14	13	15	13	13	13	15	16	16	16	16	15	16	16
	6	10	11	12	13	12	14	15	15	14	13	13	15	14	16	16	15
	7	6	9	13	13	13	13	14	14	14	13	13	16	15	15	15	16
	8	10	12	14	13	14	16	16	16	15	15	16	15	16	14	16	16
	9	9	11	15	14	15	16	15	15	16	16	16	16	16	16	16	16
	10	6	10	13	15	14	15	13	16	15	15	14	16	16	16	16	16
	11	9	13	14	14	16	15	16	16	16	16	16	16	16	16	16	16
	12	11	12	14	14	15	16	14	15	15	16	16	16	16	16	16	16
	13	8	11	13	13	11	14	14	13	14	16	16	16	16	16	16	16
	14	9	12	14	15	16	16	16	15	16	16	16	16	16	16	16	16
	15	11	14	14	14	15	16	16	16	15	16	16	16	16	16	16	16
	16	8	10	12	12	16	13	14	16	16	15	16	15	16	16	16	16
	17	7	5	12	14	15	16	14	16	15	16	16	16	16	16	16	16
	18	11	15	13	14	15	14	14	16	14	16	14	16	16	16	16	16
	19	9	11	12	15	16	15	15	16	16	16	16	16	16	16	16	16
	20	10	14	14	15	15	16	16	16	16	16	16	16	16	16	16	16
Variable Input																	
Subjects	1	12	12	12	13	15	14	13	15	15	13	15	15	15	15	16	15
	2	4	10	9	12	13	14	11	14	11	13	13	16	14	15	14	14
	3	12	14	14	14	15	16	15	15	16	16	16	16	16	16	16	16
	4	12	15	13	15	15	14	16	16	16	16	16	16	16	16	16	16
	5	9	11	12	13	14	15	16	16	16	16	16	16	16	16	16	16
	6	9	10	14	12	12	15	16	16	16	16	16	16	16	16	16	16
	7	10	10	8	11	11	12	12	12	11	14	14	14	16	16	16	16
	8	6	9	10	10	11	13	14	12	11	12	13	12	11	10	11	14
	9	10	10	12	11	13	13	13	15	15	15	15	15	16	13	15	15
	10	8	7	10	9	10	13	12	13	14	15	16	16	16	16	16	16
	11	9	12	10	9	13	12	13	13	14	15	15	14	15	14	12	15
	12	9	11	12	13	12	15	15	16	15	16	15	16	14	16	16	16
	13	9	13	12	15	14	14	15	14	15	14	16	14	16	15	15	15
	14	11	9	12	12	12	9	13	12	13	10	13	13	14	14	12	13
	15	10	12	14	15	15	15	15	16	16	15	16	16	16	16	15	16
	16	12	12	16	11	16	16	16	15	16	16	16	14	14	16	16	16
	17	11	10	12	13	13	11	13	14	13	12	12	15	14	15	15	12
	18	12	13	15	15	13	15	13	15	14	13	15	13	14	16	14	15
	19	11	13	12	13	14	13	12	14	12	13	15	14	15	15	15	16
	20	10	12	12	13	14	13	15	16	16	16	16	16	16	16	16	16

TABLE 20

EXPERIMENT II RECALL DATA

Constant Input		Trials 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Subjects	1	6	12	14	14	14	15	14	13	14	14	14	16	16	16	16	15
	2	9	12	14	15	15	14	14	14	16	16	16	16	16	16	16	15
	3	9	14	13	16	14	14	15	16	15	16	15	16	16	16	16	16
	4	8	12	15	15	15	15	15	14	14	15	16	16	15	16	15	16
	5	7	9	13	15	15	14	13	16	16	16	16	15	15	16	16	16
	6	9	11	13	13	14	14	15	14	15	16	15	15	14	15	16	16
	7	10	13	16	16	14	16	16	16	13	16	16	16	16	16	16	16
	8	10	13	13	15	13	14	16	16	16	16	16	16	16	16	16	16
	9	7	11	13	13	15	16	16	16	16	16	16	16	16	16	16	16
	10	7	14	13	14	14	14	16	14	16	16	16	16	16	16	16	16
	11	7	10	11	15	15	14	16	16	16	16	14	16	16	16	14	16
	12	7	10	13	14	13	13	15	16	16	16	16	16	16	16	16	16
	13	7	9	10	14	12	14	16	16	16	16	16	12	16	16	15	16
	14	10	12	14	15	13	16	15	16	16	16	15	16	16	16	16	16
	15	9	11	12	13	13	15	12	14	15	15	15	15	16	16	16	16
	16	10	14	14	12	14	15	16	15	16	16	16	16	16	16	16	16
	17	9	11	12	13	15	13	14	16	16	16	16	16	16	16	16	16
	18	9	14	15	15	16	16	16	16	16	16	16	16	16	16	16	16
	19	9	12	15	14	16	16	16	16	16	16	16	16	16	16	16	16
	20	5	11	10	12	15	16	16	14	16	16	16	16	16	16	16	16
Variable Input																	
Subjects	1	6	11	13	11	12	14	15	15	16	16	16	16	16	16	16	16
	2	9	11	11	11	12	10	12	12	12	13	11	13	13	12	14	16
	3	8	12	15	12	12	15	14	14	15	12	15	14	15	15	15	16
	4	9	12	12	12	11	15	14	14	15	15	15	15	15	15	14	14
	5	6	9	11	11	11	11	12	13	12	13	11	12	14	14	15	15
	6	7	11	12	14	14	15	14	14	15	15	15	14	14	15	15	16
	7	10	13	13	14	14	16	12	15	16	16	15	16	15	16	16	16
	8	11	13	14	13	13	13	15	13	13	13	13	15	16	16	16	16
	9	8	10	12	14	14	12	16	16	16	15	16	16	16	16	16	16
	10	7	9	13	11	12	13	12	13	13	14	14	15	16	15	15	16
	11	7	10	9	12	14	10	12	13	16	14	15	16	16	16	16	16
	12	9	12	13	13	15	13	14	14	14	14	15	16	14	14	15	16
	13	8	11	13	13	14	14	15	13	13	14	13	13	13	13	15	16
	14	8	10	11	10	11	11	13	12	13	14	14	16	13	15	15	15
	15	9	10	12	12	11	13	12	14	13	13	13	13	15	16	15	16
	16	9	8	12	11	13	10	12	12	13	14	14	13	13	15	16	15
	17	8	10	11	11	11	12	12	14	15	15	13	15	13	16	16	16
	18	11	13	13	13	14	15	13	15	16	16	15	15	14	15	14	16
	19	11	12	14	13	14	14	16	14	15	15	14	16	16	15	15	15
	20	10	15	12	15	14	13	15	15	16	16	16	16	16	16	16	16

TABLE 21

EXPERIMENT I ITOV DATA

Constant Input		Pairs of Trials														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Subjects	1	25	35	97	87	49	04	05	54	01	34	19	28	1.	1.	1.
	2	75	01	04	29	02	82	99	88	89	1.	1.	1.	1.	1.	1.
	3	66	73	38	48	58	29	12	30	68	62	91	92	95	90	94
	4	00	45	25	00	14	07	03	07	02	27	01	61	11	07	47
	5	19	68	00	06	24	02	07	00	75	37	98	91	91	87	1.
	6	05	73	14	00	05	00	07	19	28	01	00	12	00	11	57
	7	51	35	00	10	08	00	02	21	01	04	06	10	03	08	17
	8	07	00	36	35	10	20	57	65	60	72	09	23	48	52	87
	9	39	26	40	64	78	83	76	82	1.	1.	1.	1.	1.	1.	1.
	10	04	82	84	41	61	51	29	28	49	63	23	68	63	88	82
	11	04	27	36	27	22	30	17	39	1.	98	1.	1.	1.	1.	1.
	12	44	57	25	18	14	05	04	01	48	77	84	99	1.	1.	1.
	13	00	01	21	00	00	61	09	76	98	99	1.	1.	1.	1.	1.
	14	66	11	01	02	91	99	51	51	1.	1.	1.	1.	1.	1.	1.
	15	08	30	48	65	90	92	95	96	94	99	99	99	99	99	99
	16	62	13	56	47	86	91	1.	1.	96	98	1.	1.	1.	1.	1.
	17	00	78	05	05	27	27	13	57	96	1.	1.	99	1.	1.	1.
	18	89	90	39	00	36	12	15	00	25	03	66	01	00	55	61
	19	58	41	53	37	57	78	90	85	1.	1.	85	82	98	1.	1.
	20	08	14	19	04	47	43	91	53	1.	1.	95	24	00	05	74
Variable Input																
Subjects	1	02	06	01	21	11	18	00	03	45	08	05	05	30	12	47
	2	16	04	01	11	08	00	08	04	01	01	00	16	01	06	03
	3	29	14	00	06	05	11	15	22	00	23	28	1.	77	05	01
	4	18	16	25	04	00	30	38	68	13	00	00	25	02	28	15
	5	34	38	00	14	21	28	65	1.	1.	1.	1.	1.	1.	1.	1.
	6	48	41	05	02	00	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
	7	03	02	33	14	00	42	28	13	03	39	96	95	95	95	96
	8	98	13	06	02	05	43	02	27	58	53	79	07	13	43	01
	9	40	09	20	34	05	01	51	01	02	22	00	00	86	52	45
	10	06	78	22	30	28	47	50	56	03	90	87	95	97	98	91
	11	06	00	55	34	01	12	15	03	08	11	36	05	09	02	03
	12	21	52	13	00	54	04	06	05	63	04	25	66	56	02	17
	13	51	03	62	32	17	74	11	19	23	02	05	24	24	45	32
	14	00	14	19	54	09	10	08	00	22	60	09	02	01	03	17
	15	04	00	14	06	10	09	13	05	67	50	16	30	21	01	17
	16	12	03	01	12	12	90	06	38	07	06	14	18	41	07	99
	17	01	06	24	65	08	00	01	00	04	08	21	06	00	12	01
	18	43	09	01	11	14	05	00	06	07	01	24	00	00	00	07
	19	16	01	06	03	00	12	42	34	05	02	00	35	80	05	15
	20	29	01	03	74	00	35	69	99	99	86	86	1.	95	86	86

TABLE 22

EXPERIMENT II ITOV DATA

Constant Input		Pairs of Trials														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Subjects	1	74	07	14	09	72	43	28	00	14	61	20	49	37	36	56
	2	11	10	42	23	00	34	01	73	72	94	77	54	41	88	46
	3	08	16	14	34	37	07	38	40	41	72	92	86	94	96	81
	4	00	01	08	26	03	00	13	00	00	48	01	00	00	09	03
	5	73	00	48	03	70	02	07	87	29	73	65	79	99	99	99
	6	48	02	24	06	05	02	23	00	01	03	48	07	39	34	13
	7	67	34	11	46	18	13	33	23	00	06	58	63	25	39	28
	8	02	11	01	11	22	37	85	91	96	98	99	98	1.	1.	1.
	9	36	47	16	72	30	44	36	80	99	1.	1.	1.	1.	1.	1.
	10	78	32	35	07	27	63	01	02	87	90	1.	95	1.	02	1.
	11	81	00	00	11	48	37	05	16	08	31	93	96	92	00	09
	12	00	14	03	24	63	24	26	00	02	1.	66	66	1.	1.	1.
	13	14	53	94	97	96	95	1.	1.	1.	1.	89	71	1.	1.	1.
	14	82	01	14	05	00	13	03	05	54	08	09	13	04	47	00
	15	19	00	56	31	40	29	09	04	85	67	97	68	98	98	98
	16	19	21	33	32	39	63	52	00	06	00	57	00	32	75	72
	17	40	01	52	00	05	18	66	45	27	49	91	1.	1.	1.	1.
	18	83	00	07	61	68	84	96	1.	1.	1.	1.	1.	1.	1.	1.
	19	03	37	00	09	63	90	1.	1.	1.	1.	1.	1.	1.	1.	1.
	20	03	32	00	49	92	96	98	1.	1.	1.	1.	1.	1.	1.	1.
Variable Input																
Subjects	1	58	32	05	07	00	00	00	16	12	45	20	00	03	33	05
	2	04	02	04	09	66	08	72	48	07	02	15	15	13	00	21
	3	55	04	31	01	03	25	03	03	22	30	00	00	07	03	37
	4	14	03	06	01	17	37	03	21	10	44	57	62	39	62	01
	5	07	59	57	26	05	00	41	60	09	01	04	07	00	18	47
	6	06	34	08	01	03	40	00	01	06	03	17	05	12	10	00
	7	00	10	16	28	82	87	05	48	27	08	62	77	01	32	86
	8	27	00	07	00	11	00	08	39	03	01	01	14	01	41	61
	9	02	12	36	17	74	05	03	09	03	47	21	26	70	00	02
	10	35	01	00	24	03	01	00	04	15	27	22	64	29	20	37
	11	33	01	22	00	04	13	01	05	78	55	43	98	83	71	94
	12	00	12	01	06	01	19	70	01	04	09	11	06	00	03	06
	13	06	31	03	03	13	00	08	14	01	01	46	33	53	59	28
	14	00	20	52	32	76	06	64	68	14	90	54	30	27	47	55
	15	00	01	52	18	30	36	39	12	12	48	14	10	14	06	09
	16	00	33	00	07	22	05	01	18	08	06	48	00	70	41	09
	17	34	09	00	17	41	00	05	78	01	05	58	91	70	65	75
	18	04	25	00	05	12	12	02	15	16	21	36	21	35	10	02
	19	15	29	05	29	49	67	26	00	00	12	29	12	42	21	04
	20	03	05	22	03	00	10	00	00	01	08	00	00	01	23	56

TABLE 23

EXPERIMENT I NC DATA

Constant Input		Pairs of Trials														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Subjects	1	4	2	3	6	2	4	4	2	3	3	2	0	0	0	0
	2	3	4	3	3	2	0	1	1	0	0	0	0	0	0	0
	3	4	5	3	3	1	2	1	1	1	0	1	1	0	0	0
	4	3	6	2	3	1	0	1	1	0	0	0	0	1	0	0
	5	6	3	1	3	0	2	1	2	1	0	0	0	0	0	0
	6	3	3	3	1	3	2	1	0	0	2	2	0	2	0	0
	7	5	5	2	2	2	3	2	2	2	2	3	0	1	1	1
	8	6	4	1	1	2	0	0	0	1	1	0	1	0	2	0
	9	2	4	1	2	1	0	1	1	0	0	0	0	0	0	0
	10	4	1	3	0	2	0	2	0	0	1	2	0	0	0	0
	11	6	2	2	2	0	1	0	0	0	0	0	0	0	0	0
	12	4	3	1	2	1	0	2	1	1	0	0	0	0	0	0
	13	7	4	2	2	3	2	1	2	2	0	0	0	0	0	0
	14	4	3	1	1	0	0	0	1	0	0	0	0	0	0	0
	15	5	2	2	2	1	0	0	0	1	0	0	0	0	0	0
	16	4	5	4	4	0	3	2	0	0	1	0	1	0	0	0
	17	4	7	4	2	1	0	2	0	1	0	0	0	0	0	0
	18	5	1	3	2	1	2	2	0	2	0	2	0	0	0	0
	19	4	3	3	1	0	0	1	0	0	0	0	0	0	0	0
	20	4	2	2	1	1	0	0	0	0	0	0	0	0	0	0
Variable Input																
Subjects	1	4	2	3	2	1	1	2	1	0	2	1	1	1	1	0
	2	6	4	5	4	3	2	4	2	4	2	3	0	2	0	2
	3	3	1	1	2	1	0	0	1	0	0	0	0	0	0	0
	4	3	1	3	1	1	2	0	0	0	0	0	0	0	0	0
	5	4	4	2	3	2	1	0	0	0	0	0	0	0	0	0
	6	2	6	1	2	3	1	0	0	0	0	0	0	0	0	0
	7	3	1	5	4	3	3	3	3	3	1	2	2	0	0	0
	8	5	3	3	3	3	2	1	3	3	3	1	3	3	3	4
	9	3	5	4	4	3	2	2	1	1	1	1	1	0	3	1
	10	2	4	4	4	6	3	3	1	2	1	0	0	0	0	0
	11	4	1	4	5	3	3	3	3	2	1	1	2	0	2	4
	12	4	4	2	2	4	1	1	0	1	0	1	0	2	0	0
	13	5	2	3	1	1	2	1	2	1	2	0	2	0	1	1
	14	3	3	3	3	1	6	1	4	2	6	2	3	2	2	3
	15	3	3	2	1	1	1	1	0	0	1	0	0	0	0	1
	16	2	4	0	5	0	0	0	1	0	0	0	0	2	0	0
	17	2	5	3	2	1	3	2	2	2	2	3	1	2	1	1
	18	3	2	1	1	2	1	3	1	0	3	0	3	2	0	0
	19	2	2	2	2	1	2	4	1	2	3	1	2	1	1	1
	20	4	4	1	1	2	3	1	0	0	0	0	0	0	0	0

TABLE 24

EXPERIMENT II NC DATA

Constant Input		Pairs of Trials 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Subjects	1	7	3	2	2	2	1	2	2	2	2	2	0	0	0	0
	2	4	4	2	1	1	2	1	2	0	0	0	0	0	0	0
	3	6	2	3	0	1	2	1	0	1	0	1	0	0	0	0
	4	5	4	1	1	0	1	0	1	2	1	0	0	1	0	1
	5	4	5	3	1	1	2	3	0	0	0	0	1	1	0	0
	6	4	5	3	3	2	1	1	2	1	0	1	1	2	1	0
	7	6	3	0	0	2	0	0	0	3	0	0	0	0	0	0
	8	3	3	3	1	3	2	0	0	0	0	0	0	0	0	0
	9	5	2	3	3	1	0	0	0	0	0	0	0	0	0	0
	10	7	1	2	1	1	2	0	2	0	0	0	0	0	0	0
	11	4	2	4	1	1	1	0	0	0	0	0	0	0	0	2
	12	4	5	2	1	2	3	1	0	0	0	0	0	0	0	0
	13	3	2	5	1	3	2	0	0	0	0	0	0	0	0	0
	14	5	4	1	1	3	0	1	0	0	0	1	0	0	0	0
	15	4	3	2	2	3	0	3	2	1	1	1	1	0	0	0
	16	5	2	2	4	2	1	0	1	0	0	0	0	0	0	0
	17	4	3	2	3	1	1	2	0	2	0	0	0	0	0	0
	18	6	2	1	1	0	0	0	0	0	0	0	0	0	0	0
	19	4	3	1	2	0	0	0	0	0	0	0	0	0	0	0
	20	6	3	5	3	1	0	0	2	0	0	0	0	0	0	0

Variable Input		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Subjects	1	6	3	2	3	4	1	0	1	0	0	0	0	0	0	0
	2	4	3	2	2	2	3	2	3	2	3	3	3	2	3	2
	3	4	3	0	2	3	0	2	2	1	4	1	2	0	1	1
	4	4	4	2	4	5	1	2	2	1	1	1	1	1	0	1
	5	4	4	4	3	1	3	4	1	1	2	3	4	1	1	1
	6	5	4	3	2	2	1	2	2	1	1	1	2	2	1	1
	7	4	3	3	2	2	0	2	1	0	0	1	0	1	0	0
	8	5	3	1	2	2	2	1	3	2	2	3	1	0	0	0
	9	5	5	4	1	1	4	0	0	0	1	0	0	0	0	0
	10	3	6	3	3	4	3	3	1	3	1	2	1	0	1	1
	11	5	4	6	5	1	4	2	3	0	2	1	0	0	0	0
	12	5	4	2	3	1	3	2	1	2	2	1	0	2	2	1
	13	4	5	1	3	2	2	1	3	2	2	3	2	2	3	1
	14	4	5	4	4	4	3	0	2	3	1	2	0	2	1	1
	15	4	4	4	4	4	3	6	3	3	3	3	4	1	0	1
	16	2	5	2	3	1	5	3	3	3	2	1	2	2	1	0
	17	5	1	2	3	4	1	4	2	0	1	3	1	3	0	0
	18	4	3	3	2	1	1	2	1	0	0	1	0	2	0	2
	19	3	3	1	2	2	2	0	2	1	1	2	0	0	1	1
	20	5	1	3	1	1	3	1	1	0	0	0	0	0	0	0

TABLE 25

EXPERIMENT I NN DATA

Constant Input		Pairs of Trials														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Subjects	1	9	7	5	2	4	4	1	2	0	0	0	0	0	0	0
	2	3	0	0	0	1	1	0	0	0	0	0	0	0	0	0
	3	4	1	2	1	0	0	0	0	0	0	0	0	0	0	0
	4	7	2	1	0	0	0	0	0	0	0	0	0	0	0	0
	5	1	1	1	0	1	1	2	1	0	0	0	0	0	0	0
	6	3	2	1	2	1	0	0	1	1	1	1	1	0	0	0
	7	7	5	2	1	1	1	0	0	0	0	1	0	0	0	0
	8	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0
	9	5	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	10	6	2	0	1	0	0	0	0	1	0	0	0	0	0	0
	11	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	12	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	13	1	1	1	1	2	0	1	1	0	0	0	0	0	0	0
	14	3	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	15	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	16	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	17	5	3	0	0	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
	19	3	2	1	0	0	1	0	0	0	0	0	0	0	0	0
	20	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Variable Input																
Subjects	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2	3	1	2	0	0	0	0	0	0	0	0	0	0	0	0
	3	5	0	1	2	0	0	0	0	0	0	0	0	0	0	0
	4	3	5	3	1	2	1	1	1	2	1	0	0	0	0	0
	5	6	2	2	0	0	0	1	0	1	1	0	0	0	1	0
	6	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	7	0	2	1	1	0	1	1	0	1	1	0	0	0	0	0
	8	5	4	3	3	2	1	1	1	2	1	2	1	2	3	1
	9	3	1	0	1	0	1	1	0	0	0	0	0	0	0	0
	10	6	5	2	3	0	0	1	1	0	0	0	0	0	0	0
	11	3	2	2	2	0	0	0	0	0	0	0	0	1	0	0
	12	3	1	2	0	0	0	0	0	0	0	0	0	0	0	0
	13	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	14	2	4	1	1	3	1	2	0	1	0	1	0	0	0	1
	15	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	16	2	0	0	0	0	0	0	0	0	0	0	2	0	0	0
	17	3	1	1	1	2	2	1	0	1	2	1	0	0	0	0
	18	1	1	0	0	1	0	0	0	2	0	1	0	0	0	1
	19	3	1	2	1	1	1	0	1	2	0	0	0	0	0	0
	20	2	0	3	2	0	0	0	0	0	0	0	0	0	0	0

TABLE 26

EXPERIMENT II NN DATA

Constant Input		Pairs of Trials														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Subjects	1	3	2	1	0	0	2	0	0	0	0	0	0	0	0	0
	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	3	6	4	1	1	1	0	0	0	0	0	0	0	0	0	0
	4	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	5	3	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	6	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	7	3	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	8	3	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	9	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0
	10	3	0	0	0	1	0	1	1	0	0	0	0	0	0	0
	11	5	2	0	0	0	0	0	0	0	0	0	0	0	0	0
	12	3	0	0	0	0	1	0	0	0	0	0	1	0	0	0
	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	14	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	15	4	2	0	0	0	0	0	0	0	0	0	0	0	0	0
	16	2	1	1	1	1	0	0	0	0	0	0	0	0	0	0
	17	5	4	1	0	0	0	0	0	0	0	0	0	0	0	0
	18	5	1	1	0	1	0	0	0	0	0	0	0	0	0	0
	19	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	20	5	2	1	1	0	0	0	0	0	0	0	0	0	0	0
Variable Input																
Subjects	1	4	2	1	2	0	1	1	0	0	0	0	0	0	0	0
	2	3	2	3	3	2	3	2	1	2	0	2	0	1	1	0
	3	4	1	1	1	1	1	0	0	0	0	0	0	0	0	0
	4	3	0	2	0	0	0	0	0	0	0	0	0	0	0	1
	5	6	3	1	2	4	2	0	2	3	1	2	0	1	1	0
	6	4	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	7	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	8	0	0	1	1	1	1	0	0	1	1	0	0	0	0	0
	9	3	1	0	1	1	0	0	0	0	0	0	0	0	0	0
	10	6	1	0	2	0	0	0	2	0	0	0	0	0	0	0
	11	4	2	1	1	1	2	2	0	0	0	0	0	0	0	0
	12	2	0	1	0	0	0	0	1	0	0	0	0	0	0	0
	13	4	0	2	0	0	0	0	0	1	0	0	1	1	0	0
	14	4	1	3	2	1	2	3	2	0	1	0	0	0	0	0
	15	3	2	0	0	1	1	1	0	1	1	1	0	0	0	0
	16	5	3	2	2	2	1	1	1	0	0	1	1	1	0	0
	17	3	5	3	2	1	2	0	0	1	0	0	0	0	0	0
	18	1	0	0	1	1	0	1	0	0	0	0	1	0	1	0
	19	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0
	20	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0

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