THE INFLUENCE OF PRE- AND POST-TEST INSTRUCTION ON IMMEDIATE RECALL OF HIGH AND LOW VALUED LETTERS

by

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INTRODUCTION

Limitation of recall

The human organism can be looked upon as an information processing system. In the case of immediate recall it has been found that beyond some critical level of input no further increase in output occurs. This is not a singular result but can be observed with regard to various stimulus materials and various sense modalities. Miller (1956) in summarizing relevant studies in this area pointed out that the subject's ability to recall stimuli on an absolute basis is limited. The maximum number of stimulus categories that can be used when the stimulus is varied along only a single dimension lies somewhere around seven.

To reduce the human information processing system to a simple model it can be assumed that the information has to pass three separate stages to be transmitted (a) perception, (b) memory, and (c) recall (see Figure 1).

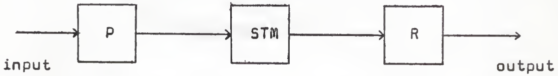

Figure 1. Information transmission model.

Limitation in any of the three stages of the model depicted in Figure 1 could cause the limitation in human information processing abilities.

In one of the earliest studies on immediate recall Glanville and Dallenbach (1929) attributed the limitation in the subject's report to limitation in the perceptual stage of this model. Since then the possibility of a perceptual limitation has been more and more abandoned in favor of a limitation in short-term memory (STM). Miller in his previously mentioned article assumed that either a limitation in perception or a limitation in the capacity of the STM might be the cause of this phenomenon.

This latter possibility was supported in a study by Teichner, Reilly, and Sadler (1961). They studied the effect of perception and STM in a visual task. Slides containing a varying number of different letters, each letter replicated a varying number of times, were projected onto a screen for one second each. The letters were randomly scattered within the projection area. Half of the subjects had to identify the letters and the other half had to discriminate and report the number of different letters. The distinction between identification and discrimination revealed a marked difference in the amount of transmitted information. Subjects were able to discriminate up to five categories of letters whereas they could correctly identify only approximately two categories. The small number of identifications could not be due to a perceptual limitation, since both groups had the same perceptual task, but rather to a limitation in STM. When the subjects were able to report the presence of up to five different categories of letters they must have discriminated the different letters but as Teichner et al. concluded they were not able to remember the names of the discriminated letters. This in turn leads to a third possibility, i.e. maybe the recall itself is limited. There are a number of recent studies which make this possibility quite reasonable.

One of the studies which supports the limited recall assumption most strongly was done by Sperling (1960). In various visual tasks subjects had to recall capital letters which were briefly exposed in orderly arranged rows and columns. The experimental design of one of his studies throws some light on limitation problem: After the exposure of a display the subjects were told to recall only the letters of one specific row. Sperling found that the number of correctly recalled letters was less than in free recall situation. However, the number remained invariant with regard to the row from which the subjects were to report. Adding up the averaged reports of all rows on a slide led to a greater number of theoretically possible reports than is usually obtained in the free recall situation. The most reasonable explanation of this phenomenon is that subjects stored more information into their STM than they were afterwards able to recall. Hence it was the process of retrieving the information stored in the STM that was limited.

To further investigate this latter possibility Taub (1965) postulated that the subject's recall strategy could be influenced by the value assigned to different reports. He divided the English alphabet into two halves and assigned different values to thetwo halves in terms of the payoff received for correctly reported letters from either half. Slides were constructed with an equal proportion of randomly selected letters drawn from both halves of the alphabet. All slides varied randomly in letter locations. Different levels of value ratio between the two alphabet halves were used for different groups of subjects. In this experiment subjects made more correct identifications, initial responses, and false reports of high valued letters than of low valued ones, supporting Taub's major hypothesis, i.e. subjects were biasing their reports in favor of the high value categories. Furthermore, a decrement in overall performance occurred with increasing value ratio. This loss in overall performance was due to a decrement in performance with the low valued letters with increasing value ratio, whereas the performance with the high valued letters remained constant, i.e. differential value led to a systematic change in the processing of information. Since the choice and arrangement of the stimulus material had been designed to minimize the effect of selective perception and since the high and low valued letters had an equal probability of being detected, it is not reasonable to assume that subjects working under the condition of small value ratio saw or stored more items than those subjects working under high value ratio. It appears more judicious to explain these results in terms of variation in the limitation of recall. This becomes more obvious with regard to the interpretation given by Christ (1965), who performed a related study and found similar results. Again subjects were found to make more initial reports and correct identifications of high valued letters than of low valued ones, and increasing value ratio decreased the average number of low valued reports while the average number of high valued reports remained constant. Christ explained the decrease in overall performance as value ratio increased in terms of an increase in mutual interference among stored symbols. That is, the higher the value ratio the stronger will be the subjects' tendency to bias their reports which leads to a higher degree of information processing in STM and a greater loss in overall performance. In addition verbal reports were obtained from the subjects after they had finished the experiment. Those reports revealed an interesting aspect. Most subjects reported that they had seen more letters than they were actually able to recall. This again could mean that subjects were not able to retrieve all letters which had been stored into STM, and supports the assumption of a limited recall.

Selective recall

Besides the fact that the above reported studies support the assumption of a limited recall they draw attention to an even more interesting fact. Not only does there occur a limitation in recall but in addition to this limitation the overall recall is biased in favor of the higher valued items (Taub, 1965; Christ, 1965). This is interpreted to mean that the recall from STM is selectively affected by differential value. Therefore, loss in information is not a haphazard event but rather a selective one. The original question, which was centered around the problem of where the limitation occurs, can now be expanded to include selection. With regard to Figure 1 the information can be assumed to be selectively affected either on its way from perception to STM or from STM to recall. Therefore a selective filter can be assumed either between perception and STM (F1) or between STM and recall (F2).

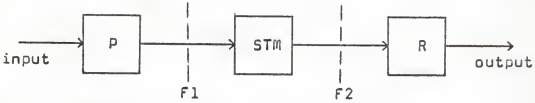

Figure 2. Assumed location of F1 and F2.

Reducing Broadbent's (1957) filter theory to a rather crude form it can be said that he assumes a filter between perception and STM (F1). He argues that for the sake of effective storage the incoming information is selected on its way to the STM or at least by the way it is stored into the STM. Broadbent's filter theory takes into account that the human information processing system is unable to analyse simultaneously all the information received from the sense organs (P). Therefore a selective operation must be performed on all the inputs coming from the receptors. For example, in a visual task like Taub's where the subjects are confronted with brief exposures of a number of differently valued items, a number exceeding the subjects' information processing ability, the filter would start to work favoring the high valued items and withholding the lower valued ones from entering the STM. The interesting aspect of this approach is that in order to guarantee an appropriate selection the subjects have to know in advance which items are of high and which are of low value. The F1 assumption leads for instance to the following hypothesis: If the instruction with regard to value differences is given after the exposure of a set of items the overall recall cannot be expected to be biased in favor of the higher valued items.

The second approach which can be derived from the results of Taub (1965) and Christ (1965) implies that there exists a filter between STM and recall (F2). At this time it is difficult to decide which assumption is the more valid one and the main purpose of this study is centered around this question.

Both assumptions lead under certain experimental arrangements to quite distinct and different predictions. In the case of selective performance Broadbent's approach (F1) implies that the instruction must have been given before the exposure of the information. The second approach (F2) does not necessarily require this. In this latter approach a selective output should also occur if the instruction with regard to high value is given immediately after the exposure of the items, i.e. after the information has been perceived and then stored in STM.

Summarizing the major points relevant to this study it can be stated: (a) There occurs a limitation in performance beyond a certain input rate. (b) The limitation in performance is not a haphazard one but rather a selective one. (c) The selection can be assumed to occur either between perception and STM or between STM and recall or both.

Hypotheses

While there could exist a filter in front of the STM (F1) the main hypothesis which was tested in this study was that there also exists a filter behind the STM (F2).

To test this hypothesis a visual task very similar to that used by Taub was chosen in which subjects had to recall briefly exposed items. Each item within an exposure came either from a high value or a low value category. The information concerning which category was of higher value was given to the subjects at two different times. Three experimental groups (the before-groups) received this information immediately before the exposure of every slide. Three other experimental groups (the after-groups) received this information immediately after the exposure of every slide. In addition, two control groups were tested under conditions for which all the items had equal values.

With regard to Broadbent's filter theory the after instruction condition could not produce any selective effect. Therefore the overall performance of the after-groups should not be biased in favor of the higher valued items and should equal those of the two control groups.

With respect to the F2 hypothesis the after-groups were predicted to report more high valued letters than low valued letters. Moreover, their differential performance was expected to deviate from the performance of the two control groups, who should show no bias, and to equal the performance of the before-groups. If this turns out to be true it would support the hypothesis of a filter behind STM (F2).

Moreover, if the subjects in the experimental groups would show a tendency to bias their reports in favor of the higher valued items their performance was predicted to be on a lower level than the performance of the two control groups. The biasing tendency was interpreted to lead to a greater mutual interference among stored symbols which in turn decreases performance (Christ, 1965).

It was also predicted that subjects in the six experimental groups would make more reports of higher valued items than of lower valued items (Taub, 1965; Christ, 1965).

In addition to differential value, the variables of value ratio and probability, which have been shown to be effective when the value instruction is given before the exposure of items (Christ, 1965; Taub, 1965), were investigated.

Increase in value ratio has been shown to lead to a decrement in overall performance (Christ, 1965; Taub, 1965). This decrement was found to be due to a reduction in accuracy for the lower value categories while tb performance of the higher value categories remains constant.

On the other hand probability, which refers to the relative frequency of letters from the high and low value categories, has not been shown to have a systematic effect. Therefore no specific prediction was made with regard to this variable. However it was expected that if probability should influence performance this influence should be equal in the before and after groups.

Summary of the Major Predictions

(1) Both the before and the after groups will show a biased overall performance in favor of the higher valued items. This effect will not occur in the overall performance of the two control groups.

(2) The overall performance of the before and after groups will be less than those of the two control groups.

(3) Subjects in the before and after groups will make

more initial reports of the higher valued items than of the lower valued ones.

(4) Value ratio and probability will have equal influences on the before and after groups.

METHOD

Apparatus and Subjects

The stimuli consisted of 12 training and 60 experimental slides, each slide contained eight capital letters of the English alphabet. The alphabet was divided into two categories of ten letters each (A through J and Q through Z). The letters from K through P were not used in order to provide a better distinction between the two halves of the alphabet. Each letter category represented a different value. Three different probability levels were used (25:75, 50:50, and 75:25), where the first number always referred to the proportion of letters on the slide drawn from the first letter category (A-J); the second number to the proportion from the second category (Q-Z). For each probability level 24 slides were constructed for a total of 60 experimental and 12 training slides. For each slide eight letters were randomly chosen, without replacement, from the two alphabetic categories in compliance with the restriction imposed with regard to the probability level for which the slide was designed. After assigning these eight letters randomly to locations within a 10 x 10 matrix the capital letters were typed on blank cards using typewriter spaces as matrix cells. These cards were photographed and made into 2 x 2 inch projection slides with white letters on a black background.

A Kodak Carousel slide projector with an externally mounted shutter was used to project the slides onto a screen. The exposure times and interslide intervals were controlled by appropriate timer equipment. The interslide interval was about 10 sec., including the one sec. exposure time.

Eighty male subjects took part in the experiment. The subjects sat in student arm-type chairs in groups of ten subjects each such that the average distance from their eyes to the projection screen was about 15 feet. The subjects performed under dim illumination, and they reported their answers on prepared cards. Each subject was given 73 cards which were held together by a ring. The ring was fixed to a writing board. The succession of cards corresponded to the succession of slides, and the subjects had to write their reports to a specific slide on the corresponding card. On top of each card for the experimental groups was printed the alphabetic category of the corresponding slide which was of higher value. For the control groups an irrelevant cue (A-Z) was printed on top of each card. The first 12 cards were provided for the 12 training slides given at the outset of each session. The 13th card was an identification card on which the subjects had to write their name and address.

The last 60 cards corresponded to the actual experimental slides.

Procedure

The experimental design was a 2x3x3x2 factorial design with value and probability as within-subjects variables, and value ratio and instruction time as between-subjects variables.

Value referred to the categories of letters (A-J and Q-Z) which were independently designated as high or low valued for every slide on top of the corresponding card.

Probability referred to the relative number of items taken from each of the two value categories. There were three different proportions: 25:75, 50:50, and 75:25, where the first number indicated the proportion of letters drawn from the higher value category and the second number the proportion taken from the lower value category. The absolute number of items on each slide was always constant.

Value ratio referred to the three ratios of differential value: 2:1, 4:1, and 8:1, where the ratio numbers referred to the points which were given for each correctly recalled item, e.g. with a 2:1 value ratio subjects got two points for each high valued item and one point for each low valued item correctly reported. For the subjects in the two control groups all items had equal value, i.e. for each correctly reported item the subjects got one point. Within each group the subjects competed for monetary prizes for the most and second most number of accumulated points.

Instruction time referred to when the information concerning which alphabetic half was of higher value was given to the subjects (before or after the exposure of the slide in question). As the high valued category was always printed on top of the card for the experimental groups, this was accomplished by telling the subjects in the respective groups to turn over to the next card either before or after the exposure of the corresponding slide.

For the before groups the buzzer preceded the exposure of every slide by 1 1/2 sec. During the period between the onset of the buzzer and the onset of the slide the subjects had to turn over to the next card and underline the higher valued category cue for that slide which was printed on top of the card and which varied from slide to slide in a prearranged random sequence. The purpose of underlining the category cue was to make sure that the subjects payed attention to it. The slide then came on for one sec. After the offset of the slide a period of 7 1/2 sec. followed during which the subjects had to make their reports. After the period for reporting, the buzzer sounded again announcing the coming of a new slide.

For the after-groups the buzzer preceded the exposure of every slide by only 1/2 sec. giving the subjects only time to look at the projection screen. Immediately after the one sec. exposure the subjects had to turn over to the next card, underline the higher valued category cue of the slide, and then made their reports. After 8 1/2 sec. the buzzer sounded again indicating the coming of the next slide.

A different control group went through each of the two instruction procedures. But as subjects in the control groups did not work under differential value they had to underline the irrelevant cue A-Z printed on top of each card; keeping the experimental conditions equivalent with the exception of the critical factor in question (value).

Each experimental session started with the experimenter reading instructions to the subjects, concerning the nature of the experiment (see appendix A). After these general instructions the subjects received practice watching the slides, turning over to the next card, underlining the higher value category, and writing answers during the interslide interval. The first two practice slides were given with feedback so that the subjects could see how many letters they reported correctly. The experimenter explained that points would be given for each correctly reported letter and that the number of points received for any particular letter was equal to the value assigned to the category the letter came from. The experimenter explained there would be no penalty for incorrect false reports, since he wanted the subjects to try very hard and to take calculated guesses. The subjects were given no knowledge of the differences in probability. Moreover, the experimenter pointed out that those two subjects in the group who accumulated the most points would receive $5.00 and $3.00 cash awards. A sequence of ten more practice slides was given to insure that the subjects were familiar with the automatic presentation of the slides. After those ten slides the subjects had to turn over to the next card which was the identification card, and on which they had to write their name and their address. Then the experiment proper started, i.e. all subjects were presented with 60 slides in a random order which was constant over groups. Each session lasted for about 30 minutes.

RESULTS

The data were analysed in terms of three measures:

(1) the absolute and relative number of times subjects reported correctly a display letter (hits),

(2) the number of times subjects reported letters which were not presented (false alarms), and

(3) the percentage of times the initial report was a high valued letter (first reports).

Hits

For a better understanding of the computational procedure the within-subjects design is given in the following scheme:

Value	Probability		
high	25	50	75
low	75	50	25

As every probability level was represented by 20 slides and each slide contained letters of both value categories each cell mean represented the subject's raw score divided by 20. This average number of hits per slide measurement was called the frequency measurement. During the analysis ot hits it was necessary to convert these frequency data into percentage data because the possible maximum number of hits per cell were different. Specifically, the maximum number of hits was two for cases where a value category occurred with a 25% probability; four, for a 50% probability; and six, for a 75% probability. Frequency and percentage scores served as data for the analysis of variances summarized in Table 1 and 2, respectively. Only in discussing the probability factor will the percentage data be needed.

It can be seen from Table 1 that all main effects except for Value Ratio were significant ($p < 0.01$ in each case). Of the first order interactions only Value Ratio x Value and Probability x Value were significant ($p < 0.05$ and 0.01, respectively). Of the higher order interactions only Instruction Time x Value Ratio x Probability x Value turned out to be significant ($p < 0.05$). Plots depicting this four-way interaction yielded no consistent nor systematic trends and therefore it will be neglected in future discussions.

The interaction between Value Ratio and Value is plotted in Figure 3 with frequency of hits as a function of Value Ratio and Value as parameter. It can be seen in this figure that the number of correct reports for the high valued letters is alway greater than for the corresponding low valued letters but there seems to be no systematic effect of Value over the different levels of Value Ratio.

The significant interaction between Probability and Value for the frequency data was expected. It should be noted that this interaction vanishes when percentage data are analyzed (see Table 2). This suggests that the high interaction between Probability and Value is completely a result of the mutual dependency of the two value categories on each slide. The differences in outcome for the frequency and percentage data can be seen in Figure 4a and 4b, respectively. Both figures show, however, that for equally probable value categories reports of high valued letters always exceeds those of low valued letters.

The significant main effect for Instruction Time was shown to be due to the after-groups making, on the average more correct reports than the before-groups. The overall number of hits per slide for the three before-groups was 3.95 and for the after-groups 4.22.

In Figure 5 the frequency of hits are plotted as a function of Value Ratio with Instruction Time as parameter. It should be noted that a 1:1 level of Value Ratio is shown in this figure. The performance of the control groups are plotted at this level (4.44 hits per slide for the before exposure control and 4.19 hits per slide for the after exposure control). Figure 5 suggests that the introduction of differential value does not influence the average number of hits per slide for the after-groups but that a decrease in performance occurs in the case of the before-groups when differential value is introduced. An analysis of variance performed on all eight groups (experimental and control groups) did not show a significant main effect for Instruction Time nor Value Ratio but did show a significant interaction between these two factors (see Table 3). Subsequent comparison of the group means showed that this interaction was due to a significantly different performance between the before-group working under a 4:1 Value Ratio and the corresponding control group ($p < 0.05$). No other between group comparisons were significant.

Figure 6 shows the percentage of hits as a function of Probability. This figure shows that the experimental groups performed best when the two value categories were of equal probability and performed less well when unequal probabilities were encountered, especially when the high value categories were more probable. This would seem to account for the significant effect of Probability.

The overall average performance with the high value categories was 2.09 hits per slide and with regard to the low value categories 1.99 hits per slide. Hence the significant main effect for Value was due to the fact that subjects in the experimental groups reported more high valued letters

Table 1

Summary of the Analysis of Variance
for Hits Performed on Frequency Data

SOURCE	DF	SS	MS	F
BETWEEN SS	59.	14.863		
INSTR. TIME	1.	1.632	1.632	7.395 **
VALUE RATIO	2.	.433	.216	.982
IT*VR	2.	.879	.439	1.992
E(IT,VR)	54.	11.917	.220	
WITHIN SS	300.	266.302		
PROBABILITY	2.	.273	.136	6.880 **
IT*P	2.	.037	.018	.949
VR*P	4.	.024	.006	.310
IT*VR*P	4.	.107	.026	1.347
VALUE	1.	.954	.954	15.429 **
IT*V	1.	.101	.101	1.646
VR*V	2.	.493	.246	3.966 *
IT*VR*V	2.	.133	.066	1.080
P*V	2.	249.438	124.719	1723.013 **
IT*P*V	2.	.226	.113	1.563
VR*P*V	4.	.243	.060	.839
IT*VR*P*V	4.	.958	.239	3.309 *
E(P)	108.	2.149	.019	
E(V)	54.	3.341	.061	
E(P,V)	108.	7.817	.072	
TOTAL	359.	281.165	.072	

* p=0.05
** p=0.01

Table 2

Summary of the Analysis of Variance
for Hits Performed on Percentage Data

SOURCE	DF	SS	MS	F
BETWEEN SS	59.	4.080		
INSTR. TIME	1.	.417	.417	6.566 **
VALUE RATIO	2.	.109	.054	.857
IT*VR	2.	.123	.061	.970
E(IT,VR)	54.	3.430	.063	
WITHIN SS	300.	5.461		
PROBABILITY	2.	.139	.069	8.211 **
IT*P	2.	.021	.010	1.243
VR*P	4.	.017	.004	.517
IT*VR*P	4.	.018	.004	.546
VALUE	1.	.357	.357	16.839 **
IT*V	1.	.042	.042	2.009
VR*V	2.	.165	.082	3.884 *
IT*VR*V	2.	.026	.013	.634
P*V	2.	.113	.056	2.684
IT*P*V	2.	.000	.000	.000
VR*P*V	4.	.047	.011	.566
IT*VR*P*V	4.	.165	.041	1.960
E(P)	108.	.918	.008	
E(V)	54.	1.147	.021	
E(P,V)	108.	2.278	.021	
TOTAL	359.	9.541		

* p=0.05
** p=0.01

Table 3

Summary of the Analysis of Variance for Hits
Performed on Frequency Data
(Experimental and Control Groups)

SOURCE	DF	SS	MS	F
BETWEE SS	79.	21.304		
INSTR. TIME	1.	.583	.583	2.548
VALUE RATIO	3.	1.831	.610	2.664
IT*VR	3.	2.396	.798	3.487 *
E(IT,VR)	72.	16.493	.229	
WITHIN SS	400.	361.951		
PROBABILITY	2.	.295	.147	7.347 **
IT*P	2.	.100	.050	2.497
VR*P	6.	.048	.008	.401
IT*VR*P	6.	.148	.024	1.232
VALUE	1.	.619	.619	10.760 **
IT*V	1.	.074	.074	1.285
VR*V	3.	.843	.281	4.884 *
IT*VR*V	3.	.161	.053	.937
P*V	2.	340.989	170.494	2485.519 **
IT*P*V	2.	.047	.023	.347
VR*P*V	6.	.415	.069	1.010
IT*VR*P*V	6.	1.291	.215	3.138 *
E(P)	144.	2.894	.020	
E(V)	72.	4.143	.057	
E(P,V)	144.	9.877	.068	
TOTAL	479.	383.256		

* p=0.05
** p=0.02

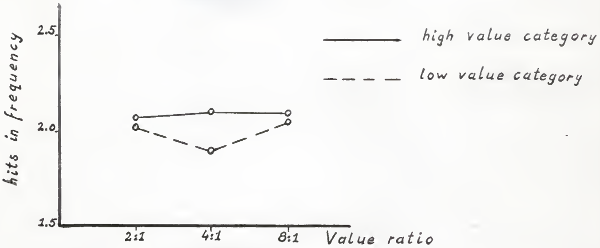

Figure 3: Frequency of hits as a function of Value Ratio with Value as parameter

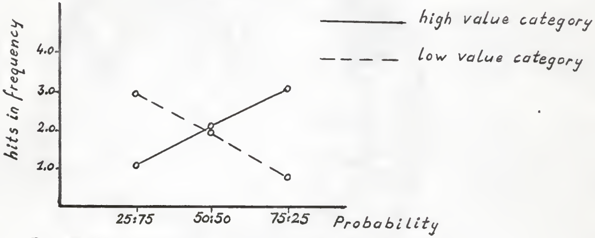

Figure 4a: Frequncy of hits as a function of Probability with Value as parameter

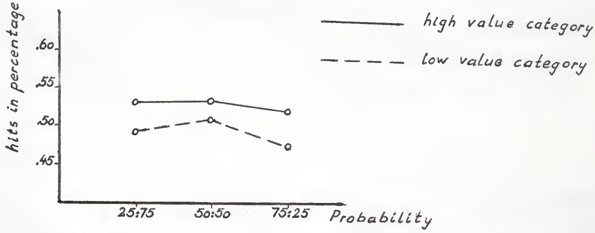

Figure 4b: Percentage of hits as a function of Probability with Value as parameter

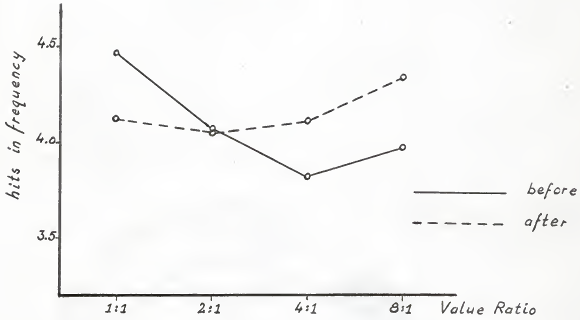

Figure 5: Frequency of hits as a function of Value Ratio with Instruction Time as parameter

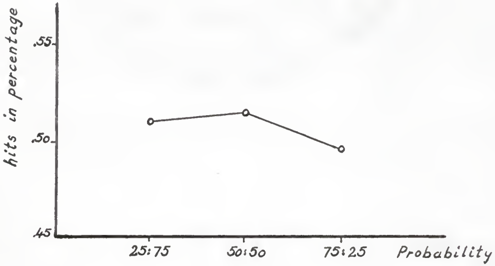

Figure 6: Percentage of hits as a function of Probability

than low valued ones. Separate analysis for just the two control groups did not show a difference between the two value categories.

False Alarms

The frequency of false alarms were computed in exactly the same way as was done for hits. The summary of the analysis of variance for these data is given in Table 4.

The only main effects which were significant were those for the two within-subject factors ($p < 0.01$, in both cases). In Figure 8 the frequency of the false alarms is presented as a function of Probability. The significant effect of Probability on false reports made by the experimental groups can be seen to be due to a linear decrease in the number of false alarms with increasing Probability of the high value categories.

The average number of false alarms with regard to the two levels of Value was 0.46 for the high value categories and 0.32 for the low value categories. The significant Value effect indicates therefore that the subjects in the experimental groups made more high valued false alarms than low valued false alarms.

Further inspection of Table 4 shows that the interaction between Probability and Value was significant ($p<0.01$). The relationship between these two factors can be seen in Figure 9 where the number of false alarms is plotted as a function of Probability with Value as parameter. Figure 9 shows that false alarms for the high valued letters decreases as a function of increasing Probability of the high valued letters. The false alarms for the low valued letters also decreases slightly as their probability increases.

Even though Table 4 shows it to be nonsignificant the interaction between the two between-subjects factors is plotted in Figure 7 to see whether there was any tendency for the number of false alarms in the after-groups to exceed the number of false alarms in the before-groups. It can be seen that this is the case for the experimental groups. Again the 1:1 Value Ratio shows the performance of the corresponding control groups. The phenomenon which was found for the hits can be seen to occur also for the false alarms; i.e. for the after-groups the introduction of Value does not seem to influence the average reports of false alarms whereas with regard to the before-groups the introduction of Value leads to a decrease in false reports. An analysis of variance for false alarms performed on all eight groups (control and experimental groups) did not show a significant interaction between Instruction Time and Value Ratio. However, the main effect for Value Ratio turned out to be significant ($p < 0.05$). Figure 7 shows that this main effect can only be interpreted to mean that the number of false reports were higher for the control group which received the value instruction before the exposure of the slide than for any other group. Simple comparison between all group means shows that this interpreta-

Table 4

Summary of the Analysis of Variance
for False Alarms Performed on Frequency Data

SOURCE	DF	SS	MS	F
BETWEEN SS	59.	26.794		
INSTR. TIME	1.	.230	.230	.473
VALUE RATIO	2.	.296	.148	.305
IT*VR	2.	.038	.019	.039
E(IT,VR)	54.	26.229	.485	
WITHIN SS	300.	14.510		
PROBABILITY	2.	.369	.184	11.720 **
IT*P	2.	.070	.035	2.238
VR*P	4.	.024	.006	.388
IT*VR*P	4.	.029	.007	.465
VALUE	1.	1.778	1.778	18.367 **
IT*V	1.	.017	.017	.179
VR*V	2.	.051	.025	.266
IT*VR*V	2.	.082	.041	.426
P*V	2.	1.371	.685	20.891 **
IT*P*V	2.	.155	.077	2.326
VR*P*V	4.	.032	.008	.246
IT*VR*P*V	4.	.053	.013	.406
E(P)	108.	1.701	.015	
E(V)	54.	5.227	.096	
E(P,V)	108.	3.545	.032	
TOTAL	359.	41.304		

** p=0.02

Table 5

Summary of the Analysis of Variance
for False Alarms Performed on Frequency Data
(Experimental and Control Groups)

SOURCE	DF	SS	MS	F
BETWEEN SS	79.	50.329		
INSTR. TIME	1.	.429	.429	.773
VALUE RATIO	3.	5.570	1.856	3.350 *
IT*VR	3.	4.422	1.474	2.659
E(IT,VR)	72.	39.907	.554	
WITHIN SS	400.	21.307		
PR/BABILITY	2.	.366	.183	9.183 **
IT*P	2.	.060	.030	1.516
VR*P	6.	.099	.016	.829
IT*VR*P	6.	.040	.006	.338
VALUE	1.	1.185	1.185	14.443 **
IT*V	1.	.049	.049	.597
VR*V	3.	.662	.220	2.689
IT*VR*V	3.	.096	.032	.393
P*V	2.	2.980	1.490	35.106 *
IT*P*V	2.	.022	.011	.269
VR*P*V	6.	.505	.084	1.985
IT*VR*P*V	6.	.343	.057	1.349
E(P)	144.	2.873	.019	
E(V)	72.	5.907	.082	
E(P,V)	144.	6.112	.042	
T/TAL	479.	71.636		

* p=0.05
** p=0.02

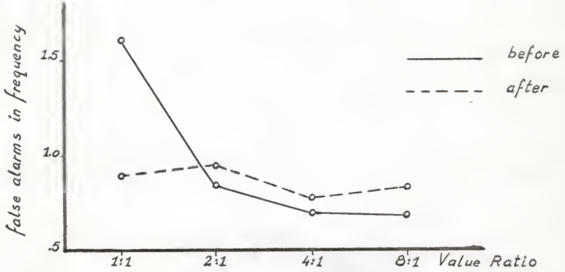

Figure 7: Frequency of false alarms as a function of Probability with Instruction Time as parameter

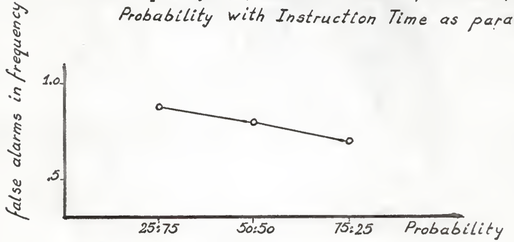

Figure 8: Frequency of false alarms as a function of Probability

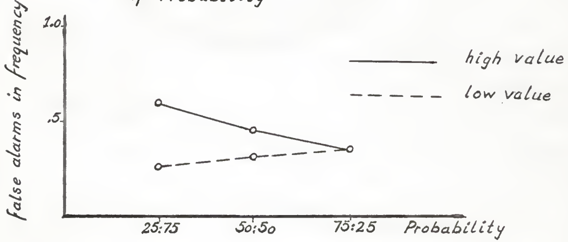

Figure 9: Frequency of false alarms as a function of Probability with Value as parameter

tion is correct.

First Reports

The first reports made to each of the 20 slides within each probability level were analyzed to determine which of the categories they came from. As the data of the high and low valued initial responses were completely dependent on each other an analysis was performed on only the percentage of first reports from the high valued categories. A summary of an analysis of variance for these data is given in Table 6.

Table 6 shows that the main effect of Probability was significant ($p<0.01$). In Figure 10 the percentages of high valued first responses are plotted with regard to the different levels of Probability. It can be seen that with increasing Probability the percentage of first reports increases too. The dotted line represents the objective probabilities of a first response being of high value. This objective curve is defined as the levels of performance which would be expected in the long run for subjects working under a 1:1 Value Ratio. In such a case the expected percentage of first reports for a certain category is equal to its probability level. It can be seen from Figure 10 that for the 25% and 50% levels the percentage of high valued first responses for the experimental groups (solid line) is higher than the expected percentage (dotted line), whereas on the 75% level it is less. However these deviations were shown to be

Table 6

Summary of the Analysis of Variance
for First Reports Performed on Percentage Data

SOURCE	DF	SS	MS	F
BETWEEN SS	59.	.757		
INSTR. TIME	1.	.009	.009	.724
VALUE RATIO	2.	.029	.014	1.128
IT*VR	2.	.018	.009	.708
E(IT,VR)	54.	.700	.012	
WITHIN SS	120.	6.345		
PROBABILITY	2.	5.229	2.614	291.263 **
IT*P	2.	.003	.001	.187
VR*P	4.	.033	.008	.925
IT*VR*P	4.	.109	.027	3.053 *
E(P)	108.	.969	.008	
TOTAL	179.	7.102		

* p=0.05
** p=0.02

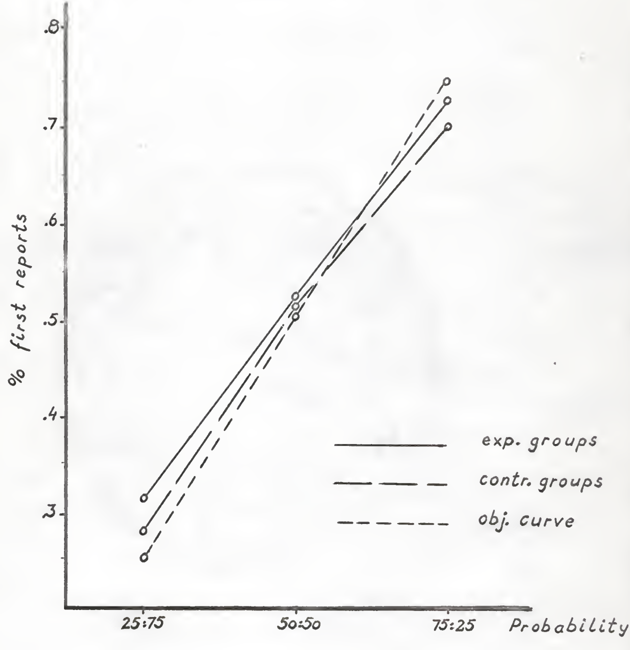

Figure 10: Percentage of first responses as a function of Probability

nonsignificant. The first response of the control groups (dashed line) should approximate the objective curve, for their Value Ratio was actually 1:1. Interestingly enough the slope of the curve for the control groups is nearly identical to the curve for the experimental groups. The only difference between both curves exists insofar as the former runs on a higher level. But again the deviation from the expected values are not significant.

Table 7 also indicates that the interaction between Instruction Time, Value Ratio, and Probability was significant ($p<0.05$). Plots of the data corresponding to this interaction showed no consistent nor systematic effects on performance.

DISCUSSION AND CONCLUSION

Four predictions were stated at the end of the Introduction of this report. The following section will discuss how well the data fulfill those predictions.

First, it was predicted that both before and after groups would show equally biased overall performance in favor of the higher valued letters. With regard to the analysis of variance this predicts a main effect for Value and the absence of an interaction between Instruction Time and Value for the experimental groups. Indeed, the respective F-ratios for the analyses of hits and false alarms support this prediction. This implies that subjects in both instruction conditions reported significantly more high than low valued letters, i.e. they biased their overall performance. Apparently the data support the major hypothesis formulated earlier in this paper. That is, going back to the model presented in Figure 2, it can be concluded that the data support the assumption of a filter between STM and recall (F2). However, nothing specific can be said about F1. The question whether a selection occurs between perception and STM is still unanswered.

At this point it could be argued that in order to get more points, subjects in the experimental groups just reported more high valued letters thus leading to more hits and false alarms. However such a strategy leads to certain predictable levels of performance. On the average each slide contained four high and four low valued letters out of corresponding populations of 10 letters each. Assuming that the subjects reported the high valued letters randomly the predicted number of high valued hits and high valued false alarms, as derived from the hypergeometric distribution, are 1.2 and 1.8 respectively. By no means do these values correspond to the actual observed values (2.09 high valued hits and 0.46 high valued false alarms). In fact, relatively few false alarms were committed by the subjects.

The second prediction stated that both control groups would perform on a higher level than the experimental groups. Implicitly it was assumed that both control groups would perform equally well, i.e. the only difference in treatment (card turning moment) was not expected to influence the overall performance. This assumption turned out to be wrong. Subjects who had to turn the cards after the exposure of the slides tended to report less letters (correctly or otherwise) than those subjects who turned the cards before the exposure (see Figures 5 and 9). A reasonable explanation of this result is the longer delay before responding for the former subjects which was caused by turning the card and underlining the irrelevant cue at the top of the card. Because of this result a lower level of performance for those experimental groups which worked under the after condition would also be expected. The data, however, show exactly the opposite result. Subjects in the after-groups reported significantly more hits and false alarms than those in the before-groups. Obviously the effect of delay of response which seems to account for the difference in performance for the control groups cannot be used to explain the differences in performance found for the experimental groups. Therefore the actual outcome has to be carefully considered in the light of the originally assumed model (Figure 2). This model suggested three different approaches to the selection problem:

(1) only F1 exists,

(2) only F2 exists, and

(3) both F1 and F2 exist.

The biased data of the after-groups eliminate the first possibility since those groups got the instruction concerning which of the two letter categories was of higher value always after the exposure of the slides.

The second possibility also appears unlikely. Introducing Value Ratio before the exposure of a slide led to different performances with the two value categories and to an overall decrease in performance relative to the corresponding control group. Introducing Value Ratio after the exposure of a slide only led to different performances with the two categories but to no decrease in performance compared with the corresponding control group. It seems reasonable to conclude that the two different times of introducing Value Ratio instruction led to two distinct processes within the subjects, which in turn implies that F2 alone cannot account for the differences in performance between before- and after-groups.

This leaves only the third possibility which states that both filters exist. To allow for a suitable explanation of the data within this framework some results which were stated in the introduction must be recalled.

The original observation was that with increasing amount of display information, the amount of recalled information increases and then levels off and remains constant as the former increases beyond a critical point (Miller, 1956). On the other hand Sperling's result showed that beyond the point where the amount of displayed information begins to level off the amount of stored information is greater than the amount of recalled information. Therefore a similar relationship to that which has been shown between amount of recalled and displayed information seems to exist between amount of recalled and stored information, i.e. the amount of informational output is a negative growth function of the information stored in the STM. If these two functional relationships are accepted the experimental results can be interpreted by making one additional assumption: The two filters work differently. F1 acts primarily to inhibit information input to STM, F2 acts primarily to select information output.

Now it is possible to account for the actual outcome of this experiment. When the value instruction is given before the exposure of the slides both filters are utilized by the subjects. F1 in attempting to select information, decreases the amount of stored information relatively to the amount of displayed information, and the amount of stored information in turn is again acted upon selectively by F2. When the value instruction is given after the exposure of the slides the amount of stored information should be greater than under the former condition because the processed information does not have to pass F1 but is only selectively affected by F2. Therefore with regard to the two conditions of Instruction Time a bias in favor of the higher valued letters can be expected in both cases, whereas only the performance of the before-groups should show a decrease.

Actually the selection with regard to the before-groups should be greater than the one of the after-groups. Plots of the data showed a slight tendency in this direction, however, the interaction between Instruction Time and Value Ratio which could be an indicator of this effect was not significant. Hence it can be concluded that F1 is a poor selector at best.

The third hypothesis stated that subjects in the experimental groups would make more initial reports of higher valued letters than of lower valued ones. This tendency could be observed at the 25% and 50% probability level. In both cases the percentage of high valued first reports was greater than the expected value. At the 75% probability level the opposite was true, i.e. subjects performed below the expected value. However, all these deviations from the expected values are insignificant which in turn leads to the rejection of the third hypothesis.

In accordance with the fourth prediction Value Ratio and Probability were expected to have equal influence under both instruction conditions.

Specifically, an increase in Value Ratio was expected to lead to a decrease in overall performance reflecting the fact that frequency of reports of high valued letters should have remained constant whereas the average frequency of reports of low valued letters should have decreased. Even though the data showed a significant interaction between

Value Ratio and Value for hits this interaction did not show the expected trend but turned out to be rather unsystematic. It was true that the performance with regard to the high value categories remained fairly constant over different Value Ratios but the decreasing performance with low valued reports as Value Ratio increased, which was found by Taub (1965) and Christ (1965), did not appear in this experiment.

The effect of Probability was not very clearcut. Probability did significantly influence the performance of both the before- and the after-groups, but again the influence was nonsystematic. The only thing which can be said and which is in accordance with the corresponding prediction is that Probability did not show different effects in the performance of the before- and after-groups. Otherwise a significant interaction between Instruction Time and Probability should have occurred which was not the case in any of the analyses.

Thus it can be said that Probability and Value Ratio affected performance in a nonsystematic way and that this was true regardless of the differences in the conditions of Instruction Time. In terms of the filter model this means that both filters worked equally with regard to these two factors.

Appendix

Instruction for the Control and Experimental Groups

As subjects in the control and experimental groups turned over to the next card either before or after the exposure of the slides the two sets of corresponding instructions are broken down into before and after sections at the critical points.

Instruction for control groups

This experiment is designed to investigate your ability to detect and then to remember alphabetic letters.

I would like to point out that this research is being supported by the U.S. Navy. They are interested in behavior of this sort since it would apply to such things as radar observation, pilots observing their control devices, etc. The outcome of this study may eventually lead to a better construction of control devices which in turn may lead to safer decisions in emergency situations.

I will project slides onto the screen. The slides will be exposed for only one sec. each. A number of different and randomly scattered letters will be on each slide. Hence, with only one sec. exposure you will have to very quickly scan the entire projection area if you want to see all the letters which are displayed. After the slide is turned off you will attempt to remember what letters you saw, recording these letters on one of the cards in front of you. You will have eight sec. to report the letters before the next slide in the series is exposed.

The letters are taken from the English alphabet. For special reasons I have only taken 20 letters of the alphabet, so that the letters from K to P will never be shown on the screen.

You will be awarded points when you correctly recall seeing a letter on the slide. For every letter correctly recalled you will receive one point. I will give $5.00 to whoever accumulates the most points and $3.00 to the next best performer. You will be competing with all the others in your group, so you all have an equal chance in winning the prizes given for the most points. Do you understand?

Before: A buzzer like this ... will precede the exposure of every slide which is the sign for you to turn immediately over to the next card. On top of each card is printed the index A-Z. It is necessary that you always underline this index after having turned over to the next card.

Let's try the first slide. For this time you don't have to turn over to the next card after the exposure of the slide. You can write on the top card. But don't forget to underline! Ready?

After: A buzzer like this ... will precede the exposure of every slide. Immediately after the exposure of the slide you turn over to the next card. On top of each card is printed the index A-Z. It is necessary that you always underline this index after having turned over to the next card.

Let's try the first slide. For this time you don't have to turn over to the next card after the exposure of the slide. You can write on the top card. But don't forget to underline! Ready?

Okay let's see what you have done. As you can see there were eight letters on the slide. Give yourself one point for each correctly reported letter. The total number of points is your score for this slide.

If you took a chance or played a hunch and reported a letter which was not even on the slide that doesn't influence your score. I want you to try very hard and to take calculated guesses if you feel sure you have seen a letter. It has been shown that if you think you saw something--you probably did. Don't just guess wildly, but play your hunches. It won't hurt your score. Remember that I will give cash awards to those people who acquire the most points.

Before: Now let's first look at another slide. You should look at the card you just reported on. As soon as the buzzer sounds turn over to the next card, underline the index A-Z, and then pay attention to the screen while the slide is being exposed. Remember that you must not write until after the slide is turned off, and that you have only eight sec. to report. Ready?

After: Now let's look at another slide. You should be looking at the card you just reported on. Directly after the buzzer sounded you will see the slide. As soon as the slide turns off go over to the next card, underline the index A-Z, and start reporting what you have seen. Remember that you have only eight sec. Ready?

How did you do this time? There were again eight letters on the screen. Give yourself one point for each correctly reported letter and sum the points up. This is exactly the way I will tally up the points you got for each slide, to find out to whom I have to give the prizes.

Under the real experimental conditions the buzzer, the one sec. exposure, and the eight sec. report-time are exactly as you have experienced on the last two slides. However you will not have a chance to check your performance. Another slide will follow the report of the previous slide in a regular sequence.

Before: The procedure is as follows: Upon hearing the buzzer you should stop whatever you are doing, turn to the next card, underline the index A-Z which is printed on the top of the card; about one sec. after the buzzer a new slide is exposed for you to scan; when the slide goes off you will have eight sec. to report what you remember seeing; and then the buzzer will sound again announcing the coming of the next slide and report sequence, etc.

After: The procedure is as follows: Upon hearing the buzzer you should stop whatever you are doing, watch the new exposed slide, as soon as the slide goes off turn over to the next card, underline the index A-Z printed on top of the card, and then report what you remember seeing; after about eight sec. the buzzer will sound again announcing the coming of a new slide and report sequence, etc.

Let's have some practice with the new procedure. We will see ten more practice slides one right after the other as it was just explained. Are you ready?

Do you all understand what your task is? Just so that I can keep track of where you are be sure that you always turn over to a new card for every different report. Also, if for any reason you are not able to make any report at all draw a large 'X' through the card corresponding to that slide, and be sure that you always turn over only one card at a time.

Now before we start please turn over to the next card. This must be a blank one. Write your name and address on this so that I can get in contact with you to hand you out your payoff.

Now we will start the experiment proper. Be ready to scan and report on a series of about 60 slides. Here we go!

Instruction for experimental groups

This experiment is designed to investigate your ability to detect and then to remember alphabetic letters.

I would like to point out that this research is being supported by the U.S. Navy. They are interested in behavior of this sort, since it would apply to such things as radar observation, pilots observing their control devices, etc. The outcome of this study may eventually contribute to a better construction of control devices which in turn may lead to safer decisions in emergency situations.

I will project slides onto the screen. The slides will be exposed only for one sec. each. Hence, with only one sec. exposure you will have to very quickly scan the entire projection area if you want to see all the letters which are displayed. After the slide is turned off you will attempt to remember what letters you saw, recording these letters on one of the cards in front of you. You will have eight sec. to record the letters before the next slide in the series is exposed.

I have divided the English alphabet into two equal categories of ten letters each. The letters from A-J form one category, and the letters from Q-Z form the other category. These 20 letters are the only ones which will be presented to you. The letters K-P will never be shown on the screen.

You will be awarded points when you correctly recall seeing a letter on a slide. I will give cash awards to those people who accumulate the most points. The number of points you receive for a correctly reported letter depende upon which category the letter came from. For each slide one of the two categories has always a higher value. There are as many cards as there are slides. The information which category is of higher value for a given slide is always printed on top of the corresponding card (you can see this on your top card). You will receive 2(4,8) points for every letter correctly recalled from the category which is printed on the card. For every letter correctly recalled from the second category you will receive only one point. I will give $5.00 to whoever accumulates the most points and $3.00 for the next best performer. You will be competing with all the others in your grop, so you all have an equal chance at winning the prize given for the most points. Do you understand?

Before: A buzzer like this ... will precede the exposure of every slide which is the sign for you to turn immediately over to the next card which simultaneously informs you which of the two categories is of higher value for the next slide. To make sure that you pay attention to the higher valued category, please always underline it after having turned over to the next card.

Let's try the first slide. For this time you don't have to turn over to the next card when the buzzer sounds. You write on the top card. But don't forget to underline the category. Ready?

After: A buzzer like this ... will always precede the exposure of every slide. Immediately after the exposure of the slide you turn over to the next card which simultaneously informs you which of the two categories is of higher value for the exposed slide. To make sure that you pay attention to the higher valued category, please always underline it after having turned over to the next card.

Let's try the first slide. For this time don't turn over to the next card after the exposure of the slide. You write the letters you remember on the top card. This will be the only time you know the higher valued category in advance. For all the following slides you will get this information always after the slide exposure, for you are supposed to turn over to the next card always immediately after the exposure of that slide. Don't forget to underline the category after the exposure. Ready?

Okay let's see what you have done. As you can see there were eight letters on the slide. Give yourself 2(4,8) points for each correctly reported letter of the higher valued category (which is printed on the top), and one point for each remaining letter if they are correctly reported. The total number of points is your score for that slide.

If you took a chance or played a hunch and reported a letter which was not even on the slide that doesn't influence your score. I want you to try very hard and to take calculated guesses if you feel relatively certain you have seen a letter. It has been shown that if you think you saw something--you probably did. Don't just guess wildly, but play your hunches. It won't hurt your score. Remember that the more letters you correctly recall from the higher valued categories the more points you will accumulate which in turn increases your chance to win one of the prizes.

<u>Before</u>: Now let's look at another slide. You should be looking at the card you just reported on. As soon as the buzzer sounds turn over to the next card, underline the higher valued category, and then pay attention to the screen while the slide is exposed. Remember that you must not write until after the slide is exposed. Remember that you must not write until after the slide is turned off, and that you have only eight sec. to report. Ready?

<u>After</u>: Now let's look at another slide. You should be looking at the card you just reported on. Directly after the buzzer sounded you will see the slide. As soon as the slide turns off go over to the next card, underline the higher valued category, and start reporting what you have seen. Remember that you have only eight sec. toreport. Ready?

How did you do this time? There were again eight letters on the screen. Give yourself 2(4,8) points for letters correctly reported from the higher valued category, and one point for each remaining letter if you correctly reported them. This is exactly the way I will tally up the points you get for each slide, to find out to whom I have to give the prizes.

Under the real experimental conditions the buzzer, the one sec. exposure, and the eight sec. report time are exactly as you have experienced on the last two slides. However, you will not have a chance to check your performance. Another slide will follow the report of the previous slide in a regular sequence.

Before: The procedure is as follows: Upon hearing the buzzer you should stop whatever you are doing, turn to the next card, underline the high valued category which is printed on the top of the card; about one sec. after the buzzer a new slide is exposed for you to scan; when the slide goes off you will have eight sec. to report what you remember seeing; and then the buzzer will sound again announcing the coming of a new slide and report sequence, etc.

After: The procedure is as follows: Upon hearing the buzzer you should stop whatever you are doing, watch the new exposured slide, as soon as the slide goes off turn over to the next card, underline the higher valued category printed on top of the card, and report what you remember seeing; after about eight sec. the buzzer will sound again announcing the coming of a new slide and report sequence, etc.

Let's have some practice with this new procedure. We will see ten more practice slides one right after the other as was just explained. Are you ready?

Do you all understand what your task is? Just so that I can keep track of where you are be sure that you always turn to a new card for every different report. Also, if for any reason you are not able to make any report at all draw a large 'X' through the card corresponding to that slide, and be sure that you always turn over only one card at a time.

Now, before we start please turn over to the special card. This must be a blank one. Write your name and address on this card so that I can get in contact with you to hand you out your payoff.

Now, we will start the experiment proper. Be ready to scan and report on a series of about 60 slides. Here we go!

Mean Performance of Hits Obtained from Frequency Data

	% high valued 25	% high valued 50	% high valued 75	% low valued 75	% low valued 50	% low valued 25
Pre-Instruction						
Value Ratio 1:1	1.120	2.175	3.360	3.340	2.260	1.125
	*(.015)	(.031)	(.065)	(.040)	(.025)	(.029)
Value Ratio 2:1	1.005	2.040	3.175	3.125	2.070	0.890
	(.024)	(.031)	(.033)	(.037)	(.030)	(.019)
Value Ratio 4:1	1.090	2.015	3.025	2.590	1.855	0.815
	(.024)	(.023)	(.025)	(.027)	(.031)	(.016)
Value Ratio 8:1	1.065	2.040	2.940	2.860	1.970	0.990
	(.023)	(.030)	(.036)	(.033)	(.024)	(.016)
Post-Instruction						
Value Ratio 1:1	1.060	2.150	3.075	3.125	2.190	1.030
	(.019)	(.009)	(.022)	(.030)	(.021)	(.012)
Value Ratio 2:1	1.030	2.085	3.125	2.930	2.105	1.000
	(.016)	(.027)	(.044)	(.049)	(.036)	(.024)
Value Ratio 4:1	1.105	2.220	3.155	3.040	2.085	0.980
	(.015)	(.019)	(.027)	(.022)	(.026)	(.012)
Value Ratio 8:1	1.095	2.164	3.325	3.230	2.310	1.000
	(.020)	(.035)	(.041)	(.047)	(.025)	(.023)

* Standard Deviation of Mean Performance

Mean Performance of False Alarms Obtained from the Frequency Data

	% high valued			% low valued		
	25	50	75	75	50	25
Pre-Instruction						
Value Ratio 1:1	1.020	0.770	0.600	0.625	0.955	1.000
	*(.059)	(.059)	(.039)	(.030)	(.054)	(.063)
Value Ratio 2:1	0.565	0.475	0.345	0.245	0.380	0.350
	(.040)	(.029)	(.017)	(.016)	(.022)	(.027)
Value Ratio 4:1	0.520	0.465	0.360	0.245	0.285	0.255
	(.039)	(.036)	(.030)	(.022)	(.014)	(.027)
Value Ratio 8:1	0.430	0.390	0.310	0.325	0.325	0.310
	(.036)	(.040)	(.025)	(.025)	(.022)	(.032)
Post-Instruction						
Value Ratio 1:1	0.580	0.430	0.325	0.3000	0.500	0.490
	(.040)	(.028)	(.018)	(.019)	(.034)	(.037)
Value Ratio 2:1	0.685	0.545	0.425	0.330	0.360	0.470
	(.071)	(.047)	(.046)	(.015)	(.039)	(.033)
Value Ratio 4:1	0.610	0.405	0.335	0.250	0.300	0.380
	(.054)	(.034)	(.021)	(.011)	(.019)	(.028)
Value Ratio 8:1	0.655	0.465	0.315	0.285	0.325	0.350
	(.079)	(.050)	(.037)	(.015)	(.020)	(.023)

* Standard Deviation of Mean Performance

Mean Proportion of First Reports which were of High Value

	% high valued 25	50	75
Pre-Instruction			
Value Ratio 1:1	0.270	0.465	0.680
	*(.016)	(.007)	(.005)
Value Ratio 2:1	0.270	0.510	0.765
	(.012)	(.010)	(.010)
Value Ratio 4:1	0.345	0.585	0.755
	(.014)	(.008)	(.012)
Value Ratio 8:1	0.340	0.490	0.715
	(.012)	(.006)	(.008)
Post-Instruction			
Value Ratio 1:1	0.360	0.545	0.775
	(.017)	(.013)	(.010)
Value Ratio 2:1	0.335	0.525	0.660
	(.011)	(.010)	(.012)
Value Ratio 4:1	0.310	0.535	0.715
	(.010)	(.007)	(.006)
Value Ratio 8:1	0.285	0.500	0.780
	(.011)	(.011)	(.009)

* Standard Deviation of Mean Proportions

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THE INFLUENCE OF PRE- AND POST-TEST INSTRUCTION ON IMMEDIATE RECALL OF HIGH AND LOW VALUED LETTERS

by

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It is known that in an immediate recall situation in which alphabetic letters of differential value are briefly exposed the Ss bias their reports in favor of the higher valued letters. In the present experiment this biasing effect was assumed to be due not only to a filtering process between perception and short-term memory (F1) but also to a filtering process between short-term memory and recall (F2).

To test this hypothesis slides with letters of the English alphabet were projected onto a screen for one sec. each. The letters were drawn from either one of two categories which were of different values. The differential ratios of value of the two categories were 2:1, 4:1, and 8:1, and the probability levels in which letters of the two categories appeared on the slides were either 25:75, 50:50, or 75:25. The instruction as to which letter category was of higher value for a specific slide was given to different experimental groups either before (before-groups) or after (after-groups) the exposure of each slide. In addition two control groups were run for which all letters were of equal value.

It was predicted that: (a) both the before- and after-groups would bias their reports in favor of the higher valued letters; (b) with regard to the observation that a biasing tendency leads to a decrease in overall performance the control groups would perform on a higher level than the experimental groups; (c) the first responses of the experimental groups would more often be high valued letters than low valued ones; (d) probability and value ratio would have equal influence on the performance under both instruction conditions.

The results supported the first hypothesis. The biasing effect was found in all experimental groups whether the value instruction was given before or after the slide exposure.

The two control groups did not perform significantly better than the experimental groups. The overall reports of the before-groups were biased and the number of their reports was smaller compared with the corresponding control group. The overall reports of the after-groups were only biased compared with the corresponding control group. This outcome was explained in terms of a selective and inhibiting quality of F1 and only a selective quality of F2.

The first reports of the experimental groups contained a preponderance of high valued letters for all probability levels, as compared with the first reports of the control groups.

The influence of probability and value ratio on performance was rather non-systematic and in no case did these two factors show different influences with regard to the before- and after-groups.