CALIFORNIA STATE UNIVERSITY, NORTH RIDGE

EXPERIMENTAL CHANGE IN CONSTRUCTIVE MEMORY

A thesis submitted in partial satisfaction of the requirements for the degree of Master of Arts in Psychology

by

James Steven Fleming

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The thesis of James Steven Fleming is approved:

Committee Chairperson

California State University, Northridge
August, 1974
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ABSTRACT

EXPERIMENTAL CHANGE IN CONSTRUCTIVE MEMORY

by

James Steven Fleming

Master of Arts in Psychology

August, 1974

This experiment involved the recall of a complex event, with particular emphasis placed on the impressionistic, subjective aspects of that event. Following Bartlett (1932) it was assumed that impressions, as well as "facts," are part of what is stored in memory, and that remembering is a constructive process in which both stored and present information are utilized.

To measure impression, Ss were given a series of statements on a Likert-like scale about a paper by Milgram (1967) from a popular magazine. This stimulus material was followed by additional "treatment" material at varying time intervals subsequent to the reading of this article. The treatment material was a critical evaluation of another study by Milgram, designed to alter Ss' impressions of Milgram and his paper (the stimulus
material). The three time intervals chosen were: immediately after the stimulus, one hour later, and two days following this initial presentation.

The Ss were also given objective multiple choice questions to provide a contrasting measure of accuracy. The Ss were divided into two groups, one of which was tested one week after the stimulus event and the other four weeks later. It was hypothesized that the treatments would have a differential effect for the judgmental scores, but the nature and direction of these differences was not specified. It was also hypothesized that forgetting (of the accuracy scores) would be evidenced by differences between the one- and four-week groups. It was predicted that, for the particular measures of judgment and accuracy used in this experiment, the judgmental scores would not vary between measurement times, nor would the accuracy scores vary according to treatment.

It was found that the hypotheses would not hold for the scores as originally defined. However, the scores were re-defined via transformation and principal components analysis with orthogonal rotation. The hypotheses were confirmed for one of four judgmental measures and an accuracy measure which were derived from the component analysis.

Comparison between means showed that it was the distance between the two-day and the baseline or control
group which accounted for the significance of the findings. It was suggested that a lessened importance of the primacy effect for the initial stimulus might account for these results.
EXPERIMENTAL CHANGE IN CONSTRUCTIVE MEMORY

James Steven Fleming
California State University, Northridge

This experiment was planned with the hope that it would provide some insight into the way in which an entire experience is recalled—not only the objective, verifiable aspects of the experience, but also the subjective, impressionistic aspects. As such it is neither a beginning nor an end. It is, rather, an extension of the functionalism of Bartlett (1932) and others (e.g., Neisser, 1967) who have taken the position that remembering is an active, constructive process; that a part of what is stored in memory are subjective impressions, attitudes, opinions, and the like—as well as the "facts" in any complex situation.

Bartlett theorized that people remember by re-creating the past from stored "schemata." These "schemata" are skeletonized versions of past events, determined in part by other past events of a similar kind, and influenced by such factors as attitude and present perceptions and cognitions. With respect to these "schemata," Bartlett believed that over time "... what emerges is an attitude toward the massed effects of a series of past reactions. Remembering is a constructive
justification of this attitude." (1932, p. 208.)

Those who have been interested in constructive memory (e.g., Bartlett, 1932; Elmgren, 1934; Paul, 1959) have examined various types of materials to determine the way in which these stimuli influence remembering and the schematic processes related to remembering. Little has been done in the way of altering such processes experimentally, however. An interesting exception is the study by Miller (1967) who presented his Ss with a list of adjectives describing a hypothetical person, followed later by some biographic material designed to alter Ss' selectivity with respect to the original list. Miller succeeded in this and was able to elicit an increase in the number of adjectives imported by Ss which were consistent with the type of biographic material presented.

The present experiment is similar to Miller's in scope, since it represents an attempt to change the reconstruction of a stimulus event after the actual occurrence of that event. But this experiment differs from previous work in this area in that it is concerned with the importance of timing and its relationship to the anticipated change in the reconstruction. The problem is that of varying the time intervals for presentation of the treatment following the initial stimulus event. In this approach a testing time which is a fixed number of days from that initial event is assumed. The purpose of the
experimental manipulations is to determine which time point (or points) following the stimulus presentation are optimal for altering Ss reconstructions and what sort of a curve might be described to fit these observations. The time intervals selected are discussed in the next section following a consideration of certain methodological problems.

Methodological Considerations

Most research in human memory is concerned with the accuracy of Ss' responses according to well-defined criteria for objective "correctness." A different approach was taken in this study, as some of the tasks which were introduced required no "correct" response as such. Instead Ss were asked to make judgments or evaluations which called for the use of previously stored information. For these tasks the measures consisted of Ss' ratings of a series of evaluative statements about some written material on a Likert-like scale. These measures were taken after Ss were given additional information concerning the stimulus material at varying time intervals as discussed above. The methodology is similar to that sometimes used by social psychologists in attempting to assess the way in which certain bits of information can alter the Ss' perception of persons or situations (e.g., Asch, 1946; Kelley, 1950). An important difference is that, unlike the social perception experiment, the "key" information
was provided only after exposure to the stimulus.

In the perceptual experiment the experimenter attempts to establish some sort of set or Einstellung which in turn influences perceptual selectivity. In the present experiment, by contrast, the perception has already taken place before the treatment is introduced. What is altered, then, is the reconstruction of the initial event based upon stored, as well as present, cues. The issue is whether or not this reconstruction (as defined by Ss' ratings) differs for those who have received the treatment (i.e., subsequent information regarding the stimulus) from those who have not. If such a difference were found after a substantial time had elapsed following the treatment then it would seem reasonable to argue that the memory had been altered.

An assertion like the one above is, of course, dependent upon the way in which "memory" is conceptualized. In the present context the emphasis is decidedly behavioral--what is "recalled" is taken to be that which is reconstructed, irrespective of what may or may not be fixated in the nervous system. Still, it is worth looking at some interpretations based upon theories of consolidation (fixation of long-term memories over time) and retrieval, since so much important work has recently been done in these areas regarding memory change.

Most of the data regarding changes in memory are
primarily concerned with the loss of information which occurs during retrograde amnesia. This phenomenon may be observed in trauma or studied in laboratory animals which have undergone electro-convulsive shock treatment or have been subjected to various drugs (McGaugh, 1966; McGaugh and Dawson, 1971). Although consolidation theories have long been popular it seems uncertain at present whether these changes in memory are due to interference with the consolidation processes or with retrieval mechanisms (e.g., see Lewis, 1969). In any case the "consolidation" time may vary because of many variables, including the type and quantity of drug administered. In animal experiments, for example, this time has been reported for as short a period as one hour and for as long as three days following treatment (Gross and Zeigler, 1969). For these reasons this work in neuropsychology is not necessarily helpful in the selection of appropriate time intervals for this study. It is conceivable that the consolidation time for the materials used in this experiment might be affected by the complexity of the stimulus itself and by the extended verbal encoding processes which might be expected to occur afterward. Thus the three times selected were chosen on a somewhat arbitrary and intuitive basis and also according to practical limitations.

One of the three experimental groups received the treatment immediately after the stimulus material was
presented, another one hour later, and a third group two
days following the initial presentation. A control group
was included to provide a baseline for comparisons
against the other groups. The control group was also in-
tended to equalize any retroactive inhibition effect on
the recall of the stimulus material which might be caused
by the treatment (the control procedures are detailed in
the methods section.)

This experiment was designed to explore the
timing of presentation of the stimulus material, and no
theoretical investment was made in any particular outcome.
Some possibilities were considered, however. It might be
expected (following the work in consolidation theory)
that it would be easiest to change the reconstruction
soon after the occurrence of the initial event, before
consolidation processes have been completed. If this
were the case the group which received the treatment im-
mediately after the initial stimulus should be the most
"malleable" or easiest to influence. On the other hand,
there is a strong body of evidence from the research in
social perception that primacy is the critical factor in
impression formation (e.g., Asch, 1946; Anderson and
Barrios, 1963). This means, in essence, that first im-
pressions tend to prevail. According to Anderson (1973)
"The best current explanation of the primacy effect is
attention decrement." If this were indeed the case then
it might be anticipated that the "immediate" group would be less effective than the others and that the effectiveness of the treatment would increase with its distance from the stimulus. A lengthy delay between stimulus and treatment would allow Ss to recover their attentive capacities. It might even be that an interaction could exist between the effects due to primacy and due to interference with consolidation which would result in a curvilinear function over time.

Accuracy of Recall

For interest and for purposes of contrast an accuracy score was added to measure retention of the factual content in the stimulus material. The Ss were divided into two groups, each group being assigned to one of two testing times which were established in order to get a measure of forgetting for these accuracy measures. The first testing occurred one week after presentation of the stimulus and the other four weeks from that time. It was predicted that, although these accuracy scores would decrease over time, they would not be affected by the treatment material. Conversely, it was predicted that the treatment would affect the judgmental responses, but that these responses would not vary between the two testing times. No formal statistical hypotheses were offered for the "no effect" predictions, as this would present methodological and interpretive difficulties of the sort
encountered when attempting to "uphold" the null hypothesis. The accuracy measure was included not for the purpose of establishing a theoretical independence between "objective" and "subjective" remembering, but rather to show that recall for the objective aspects of a situation need not necessarily correlate or vary systematically with the judgmental measure.
METHOD

Subjects

Ninety-six students from first-year psychology courses at California State University, Northridge, volunteered for this experiment in order to fulfill a course requirement for experimental participation. They were recruited directly from classrooms. Due to complex scheduling requirements it was not possible to randomly assign Ss to the experimental conditions although there was no reason to believe that the results were systematically biased in any way. Of the 96 Ss, 50 were women and 46 were men. Their mean age was 18.5 years with a standard deviation of 3.3. Care was taken to control for prior exposure to the stimulus material, and a number of Ss were replaced because related material had been introduced in their classes. The Ss were told beforehand only that the experiment involved "reading and evaluation of psychological literature" and that reading and filling out forms were the only necessary tasks. From one to six Ss participated in each experimental or testing session.

Experimentors

Two psychology students conducted the experiment. Because of the failure of many Ss to complete all experimental and testing sessions at their appointed times it
was not possible to balance Es among all conditions.

Materials and Procedure

The stimulus material (to be "remembered" by Ss) was a 5500-word paper titled "The Small World Problem," by Stanley Milgram (1967) which had appeared in a popular magazine. This paper reported Milgram's finding that surprisingly short chains of personal acquaintanceship were needed in order to forward written messages via ordinary mail from senders in two cities to a target person in another city. This paper included a discussion by Milgram of current theories and principles of social communication by personal acquaintanceship in contemporary U. S. society.

The treatment material was a 2300-word paper by Diana Baumrind (1964) which criticized Milgram's treatment of his Ss in his work on obedience (Milgram, 1963). From E's instructions and from the content of Baumrind's article, it ought to have been clear to Ss that this was a criticism of a different study (though by the same author) than the one they had previously read. In her paper Baumrind claimed that Milgram's procedures (in his "obedience study") were damaging to the dignity and self-worth of his Ss, and that he did not do all he could to restore his Ss' self-esteem upon completion of the experiment. It was hypothesized that this exposure to the severe criticism of Milgram's work, presented without any offsetting defense, would cause a negative impression to be formed
in the Ss toward Milgram, and hence, toward the stimulus article. It was thought that at least part of this effect, if present, might be attributable to an identification by the Ss in the present experiment with those in Milgram's "obedience study."

The four treatment groups were denoted $T_0$ (immediate treatment), $T_1$ (one-hour group), $T_2$ (two-day group), and $C$ (control or baseline group). The $C$ group received the same treatment as the $T_0$ group except for the following: (1) Milgram's name was removed from the copy of "The Small World Problem" given to these Ss, and (2) no reference was made to Milgram by name in E's instructions to this group with respect to "The Small World Problem." Thus no logical link was provided between the two papers for the $C$ group.

The following instructions were given all but the $C$ group at the first session before reading "The Small World Problem":

I would like to ask you to read the first article [hand Ss article] carefully and at your own rate. It was written by Stanley Milgram, a social psychologist. He received an award for outstanding work in his field from the American Association for the Advancement of Science, but please bear in mind that the award was not given for the paper you are about to read. It was presented for a completely different work by the same author. If there are no questions you may begin.

The background information about the award was included with the hope that it might help foster an
initial positive impression of the author and his paper. The second sentence for the C group was modified to read "The author received an award for his . . . (etc.)," eliminating the reference to Milgram by name.

The T₀ group was given these instructions after reading the paper:

Before you leave I have another task for you. I would like you to read this article [hand Ss Baumrind article]. It is a critical evaluation of the work of Stanley Milgram, the author of the paper you just finished reading. Please note, however, that this is not a criticism of that paper, "The Small World Problem," but of a completely different work by the same author. If everything is clear and there are no questions you may begin.

The instructions for the C group differed in that only the first two sentences were read. For the T₁ and T₂ groups the special instructions for the T₀ group were repeated with "read one hour ago" or "read two days ago" substituted for "just finished reading".

Two questionnaires were administered at the testing session. The first consisted of 10 multiple-choice questions designed to measure the accuracy of "objective" recall of "The Small World Problem." These were followed by a series of 10 evaluative statements about "The Small World Problem" which Ss rated on a six-point scale ranging from "strongly agree" to "strongly disagree." The ordering of the statements was balanced so that the even-numbered ones were favorable to the author's work
and the odd-numbered ones were unfavorable.

The second questionnaire was used to collect supplementary information and comments. It included interest ratings of the two papers which were read by Ss and three evaluative statements about Milgram's "obedience study" which were rated in a manner similar to the "Small World" statements.

Copies of the two questionnaires are appended to this paper for reference.

**Scoring**

An accuracy score for each S was obtained as the total number of objectively correct responses to the 10 multiple-choice questions. The ratings were scored as follows for the even-numbered statements (favorable to "The Small World Problem"): 6 for "strongly agree," 5 for "agree," 4 for "mildly agree," 3 for "mildly disagree," 2 for "disagree," and 1 for "strongly disagree." Scoring was similar for the odd-numbered statements (unfavorable) but the numerical scale was reversed. The sum of these scores was taken as the judgmental measure with higher scores indicating a more positive response than lower ones.

**Design**

The design is a 4 x 2 factorial with 12 Ss per cell. The two independent variables are the four treatment conditions and the two levels of measurement time,
respectively. There were two measures per S, an accuracy score and a judgmental score. A multivariate analysis of variance (MANOVA) for fixed effects was planned for the analysis of the data, with post hoc comparisons to be made between means where appropriate.
RESULTS

A preliminary examination of the judgmental scores (via univariate analysis of variance) indicated no significant differences among treatment conditions could be expected in the more complete analysis proposed in the previous section (see Table 1). However, further exploration of the data showed that under certain conditions all of the hypotheses would hold. Attaining these conditions involved some refinements and adjustments to the measures. These refinements and adjustments are discussed in the next several sections.

Transformation and Factoring

Frequency histograms for the individual items comprising the judgmental scale showed that the obtained distributions were markedly skewed. This is because Ss tended toward a favorable evaluation. Squaring each observation stretched the right tails of these distributions so that they were more symmetric and "normal" appearing. Presumably such transformations would improve the estimates of any true correlations among the different items in the scale.

The transformed scores for the judgmental scales along with the accuracy measure were analyzed using the method of principal components. The eigenvalues
Table 1

Analysis of Variance for Judgmental Scores (as Originally Defined)

<table>
<thead>
<tr>
<th></th>
<th>Mean Square</th>
<th>df</th>
<th>F</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measurement Time</td>
<td>8.17</td>
<td>1</td>
<td>0.17</td>
<td>N.S.</td>
</tr>
<tr>
<td>Treatments</td>
<td>57.25</td>
<td>3</td>
<td>1.19</td>
<td>N.S.</td>
</tr>
<tr>
<td>Interaction</td>
<td>51.86</td>
<td>3</td>
<td>1.08</td>
<td>N.S.</td>
</tr>
<tr>
<td>Error</td>
<td>48.07</td>
<td>88</td>
<td></td>
<td></td>
</tr>
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associated with all of the components and the proportion of variation accounted for by each are shown in Table 2. Five components accounting for about 68 per cent of the total variation were rotated using the normal varimax transformation. The loadings are displayed in Table 3, along with the sums of squares for rows and columns. The names of the variables appear to the left of the table, as labels for the rows.

This pattern matrix appears to provide an excellent approximation to orthogonal simple structure. When the two largest loadings for each component are underlined it can be seen that the pairs of loadings which are high for one component are low for others. Furthermore, most of the other loadings for each component are low to moderate. The absence of a "general factor" is indicated by the fact that there is little difference in magnitude between these components, as evidenced by the sums of squares for the columns. These range from 1.74 for the highest to 1.33 for the lowest.

The components were interpreted. Both a complete phrase and an abbreviated label were given for each. The interpretive phrases are listed, with the briefer label for each component underlined, as: (1) "generalizability of results, or ecological validity," (2) "enthusiasm for, and identification with, this experiment," (3) "evaluation of experimental design," (4) "ease of reading and
Table 2

Eigenvalues for the Component Analysis*

<table>
<thead>
<tr>
<th>Component</th>
<th>Eigenvalue</th>
<th>Percentage of Variation</th>
<th>Cumulative Percentage of Variation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2.57</td>
<td>23.36</td>
<td>23.36</td>
</tr>
<tr>
<td>2</td>
<td>1.71</td>
<td>15.54</td>
<td>38.91</td>
</tr>
<tr>
<td>3</td>
<td>1.27</td>
<td>11.55</td>
<td>50.45</td>
</tr>
<tr>
<td>4</td>
<td>1.04</td>
<td>9.45</td>
<td>59.91</td>
</tr>
<tr>
<td>5</td>
<td>0.93</td>
<td>8.45</td>
<td>68.36</td>
</tr>
<tr>
<td>6</td>
<td>0.83</td>
<td>7.55</td>
<td>75.91</td>
</tr>
<tr>
<td>7</td>
<td>0.71</td>
<td>6.45</td>
<td>82.36</td>
</tr>
<tr>
<td>8</td>
<td>0.58</td>
<td>5.27</td>
<td>87.64</td>
</tr>
<tr>
<td>9</td>
<td>0.56</td>
<td>5.09</td>
<td>92.73</td>
</tr>
<tr>
<td>10</td>
<td>0.47</td>
<td>4.27</td>
<td>97.00</td>
</tr>
<tr>
<td>11</td>
<td>0.33</td>
<td>3.00</td>
<td>100.00</td>
</tr>
</tbody>
</table>

* Only the first five components were retained.
Table 3

Rotated Component Loadings
(Highest Loadings for Each Component are Underlined)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Component</th>
<th>Sum of Squares</th>
</tr>
</thead>
<tbody>
<tr>
<td>The &quot;Small World Problem&quot; was well-designed and carefully planned</td>
<td>.21</td>
<td>.78</td>
</tr>
<tr>
<td>The author disrupted the lives of the people who helped him with his experiment</td>
<td>.04</td>
<td>.63</td>
</tr>
<tr>
<td>This study represents a major contribution to the field of social psychology</td>
<td>.01</td>
<td>.68</td>
</tr>
<tr>
<td>It would be difficult to try to generalize the results of this experiment to the &quot;real world&quot;</td>
<td>.64</td>
<td>.60</td>
</tr>
<tr>
<td>It would be worthwhile for the author to do a follow-up study using the same methods, but varying such elements as locale, distance, and economic class</td>
<td>-.07</td>
<td>.70</td>
</tr>
</tbody>
</table>
Table 3  
(Continued)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Component 1</th>
<th>Component 2</th>
<th>Component 3</th>
<th>Component 4</th>
<th>Component 5</th>
<th>Sum of Squares</th>
</tr>
</thead>
<tbody>
<tr>
<td>The author omitted too many relevant variables and details</td>
<td>.37</td>
<td>-.13</td>
<td>.66</td>
<td>-.10</td>
<td>.25</td>
<td>.67</td>
</tr>
<tr>
<td>It would have been fun participating in this experiment as a subject</td>
<td>.19</td>
<td>.71</td>
<td>.23</td>
<td>.23</td>
<td>-.04</td>
<td>.65</td>
</tr>
<tr>
<td>The results fail to provide sufficient support for the author's theory</td>
<td>.82</td>
<td>.09</td>
<td>.11</td>
<td>.19</td>
<td>.01</td>
<td>.74</td>
</tr>
<tr>
<td>This paper (&quot;Small World&quot;) was well written and easy to read</td>
<td>-.14</td>
<td>.27</td>
<td>.37</td>
<td>.57</td>
<td>.30</td>
<td>.64</td>
</tr>
<tr>
<td>The author should have used a larger sample with more controls</td>
<td>.59</td>
<td>-.20</td>
<td>.43</td>
<td>.16</td>
<td>-.12</td>
<td>.62</td>
</tr>
<tr>
<td>(Accuracy score)</td>
<td>.15</td>
<td>.00</td>
<td>-.23</td>
<td>.86</td>
<td>.00</td>
<td>.81</td>
</tr>
<tr>
<td>Sum of Squares</td>
<td>1.71</td>
<td>1.64</td>
<td>1.51</td>
<td>1.34</td>
<td>1.33</td>
<td>7.53</td>
</tr>
</tbody>
</table>
accuracy of retention," and (5) "theoretical value, or contribution, of this paper." The fourth component appears to be an alternate to the accuracy score as it was originally defined. Thus the two original dependent scores may be viewed as composites of several independent components (this is particularly true for the judgmental score, since only one of the components seems to relate to accuracy). Revised Plan for Analysis

The component analysis showed that the judgmental score, originally defined as the total of the ratings for "The Small World Problem," was really a composite variable of several independent components. Thus it was not a homogeneous measure. For this reason the two original scores were replaced by the five component scores--four judgmental measures (rather than one) and a new measure of accuracy. One consequence of this reorganization of the data is that the MANOVA was no longer necessary. The derived measures share no common variation by virtue of the orthogonality of these components. Such procedures are advocated by Pinneau, et al (Pinneau, Levine, Schurr, and Butler, 1966; Pinneau, Butler, Levine, and Schurr, 1965; Pinneau, Schurr, Butler, and Levine, 1966). They have referred to these procedures as "analysis of factor variance and covariance."

The layout itself was not altered--four treatment groups by two measurement times--but covariates were added
to increase statistical control over possible fluctuations due to individual differences.

**Covariates**

In conversing with Ss who had been in the experiment it was noted (subjectively) that there seemed to be a great deal of difference between individuals with regard to the impact of the treatment. One student, for example, claimed to be disturbed by the "obedience" studies to the extent of losing sleep for two nights afterward. Certain others seemed to approve of the "obedience" studies even though Baumrind's presentation of this research was negative and one-sided.

Several auxiliary measures were available for use as covariates in order to provide some control for individual differences. These included sex, interest ratings for "The Small World Problem," and the three ratings of the "obedience study." For the interest ratings Ss had been asked to rate "The Small World Problem" as follows: 1 for "very interesting," 2 for "interesting," 3 for "neutral impression," 4 for "uninteresting," 5 for "very dull," and 6 for "don't really recall." The three rating scales for the "obedience study" (herein denoted "BS01," "BS02," and "BS03," respectively) were scored on the same six-point scale as the ratings for "The Small World Problem." The statements which were rated were: "Milgram's procedures were justified in terms of the scientific
knowledge gained" ("BS01"), "Milgram was not able to properly 'desensitize' his subjects after they discovered the purpose of his study" ("BS02"), and "His findings are important" ("BS03").

Analysis of Variance and Covariance

Analysis of variance tests were performed for each of the five components. None of these showed significance for either of the two independent variables (treatment and measurement time). Two of these analyses were in the direction of significance, however (p < .10 for both). These were the "accuracy" component (for the measurement time variable) and the "identification" component (for the treatment variable). These components were chosen for further analysis using covariance procedures.

The interest ratings were used for adjusting the "accuracy" measures in the analysis of covariance for this component. This adjustment was sufficient for achievement of significance (p < .025), indicating that a substantial loss of accuracy of retention occurs between the two measurement times (one week and four weeks). The results of the analysis of variance and the covariance analysis for the "accuracy" component are summarized in Table 4.

An exploration of the various measures which were available for use as covariates showed that either sex or the "BS03" ratings could be used to increase the significance of the "identification" component to the .05 level.
Table 4

Analysis of Variance and Covariance for the "Accuracy" Component, with Interest Rating for "The Small World Problem" as the Covariate

<table>
<thead>
<tr>
<th></th>
<th>Mean Square</th>
<th>df</th>
<th>F</th>
<th>P</th>
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<tbody>
<tr>
<td><strong>Analysis of Variance</strong></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Measurement Time</td>
<td>3.23</td>
<td>1</td>
<td>3.17</td>
<td>.10</td>
</tr>
<tr>
<td>Treatments</td>
<td>.69</td>
<td>3</td>
<td>.68</td>
<td>N.S.</td>
</tr>
<tr>
<td>Interaction</td>
<td>.22</td>
<td>3</td>
<td>.22</td>
<td>N.S.</td>
</tr>
<tr>
<td>Error</td>
<td>1.02</td>
<td>88</td>
<td></td>
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</tbody>
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<tbody>
<tr>
<td><strong>Analysis of Covariance</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Measurement Time</td>
<td>5.25</td>
<td>1</td>
<td>5.51</td>
<td>.025</td>
</tr>
<tr>
<td>Treatments</td>
<td>.88</td>
<td>3</td>
<td>.92</td>
<td>N.S.</td>
</tr>
<tr>
<td>Interaction</td>
<td>.12</td>
<td>3</td>
<td>.13</td>
<td>N.S.</td>
</tr>
<tr>
<td>Error</td>
<td>.95</td>
<td>87</td>
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</table>
of acceptance. The results of these analyses are summarized in Tables 5 and 6.

Comparisons Between Means

Certain post hoc comparisons were made to contrast adjusted means from the covariance analyses for the "identification" component. All comparisons involved the marginal treatment means, collapsing across measurement times. These were compared to control means for both the case in which sex was the covariate and in which "BS03" was the covariate. Using Tukey's HSD procedure to construct the confidence intervals it was found that only the two-day group for the sex covariate was significant. The 95 per cent confidence interval for this comparison is (+1.34, -.10).

Figure 1 provides a graphic display of means for the "identification" component with both covariates.
Table 5

Analysis of Variance and Covariance for the "Identification" Component, with Sex as Covariate

<table>
<thead>
<tr>
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<th>Mean Square</th>
<th>df</th>
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</thead>
<tbody>
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<td><strong>Analysis of Variance</strong></td>
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<tr>
<td>Measurement Time</td>
<td>.09</td>
<td>1</td>
<td>.09</td>
<td>N.S.</td>
</tr>
<tr>
<td>Treatments</td>
<td>2.40</td>
<td>3</td>
<td>2.41</td>
<td>.10</td>
</tr>
<tr>
<td>Interaction</td>
<td>.97</td>
<td>3</td>
<td>1.01</td>
<td>N.S.</td>
</tr>
<tr>
<td>Error</td>
<td>.96</td>
<td>88</td>
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<td></td>
</tr>
<tr>
<td>Measurement Time</td>
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<td>.04</td>
<td>N.S.</td>
</tr>
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<td>Treatments</td>
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<td>3</td>
<td>3.07</td>
<td>.05</td>
</tr>
<tr>
<td>Interaction</td>
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<td>3</td>
<td>1.94</td>
<td>N.S.</td>
</tr>
<tr>
<td>Error</td>
<td>.88</td>
<td>87</td>
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Table 6

Analysis of Covariance for the "Identification" Component, with Rating on "Obedience Studies" ("BS03") as Covariate

<table>
<thead>
<tr>
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<th>Mean Square</th>
<th>df</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
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<td>Measurement Time</td>
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<td>1</td>
<td>.61</td>
<td>N.S.</td>
</tr>
<tr>
<td>Treatments</td>
<td>2.58</td>
<td>3</td>
<td>2.89</td>
<td>.05</td>
</tr>
<tr>
<td>Interaction</td>
<td>1.07</td>
<td>3</td>
<td>1.19</td>
<td>N.S.</td>
</tr>
<tr>
<td>Error</td>
<td>.89</td>
<td>88</td>
<td></td>
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</tbody>
</table>
Fig. 1. Adjusted mean component score for the "identification" component.
DISCUSSION

The results of the covariance analyses for the "identification" component (Tables 5 and 6) support the contention that it is possible to alter what is remembered by changing Ss' impressions of a situation after its occurrence. This conclusion is based upon the differences in Ss' reconstructions following appropriate treatment. Interestingly, the only real (pairwise) difference among the various treatment conditions lies in the distance between the baseline (or control) group and the two-day group, for the case in which sex was used as the covariate.

It was only possible to achieve significance in this experiment when scores were adjusted for individual differences. The importance of such differences in both memory abilities and impression formation has been discussed elsewhere (Gomulicki, 1956; Paul, 1959). The covariates which were chosen may represent only a sampling of variables from a hypothetically relevant set. The author's subjective impression was that Ss reacted differentially to the treatment material. Thus personality variables are probably essential to such a hypothetical set of potential covariates.

The Ss' sex was another important factor in this
experiment. A look at the treatment means by sex showed the men were more sensitive to the treatment than the women. It would be difficult to draw any conclusions on the basis of these differences, since (1) they are not statistically significant by themselves, and (2) they may be limited to the population of "young college people interested in psychology." But the results appear to indicate that, if anything, the men reacted to the stimulus material more emotionally than the women, and this seems contrary to the cultural stereotypes.

Controlling for differences in reaction among Ss by selection of a proper sample of covariates would help in establishing the "true" shape of the curve shown in Figure 1. This curve is quadratic in appearance, and yet the "true" curve might be monotonic or a step function. The observed shape could be due to a random fluctuation between the immediate and one-hour groups which would "correct itself" in a replicated study. Such a replication would be worthwhile with the addition of a few more time intervals and appropriate controls for the differential reactions of Ss to the stimulus material.

There is also the possibility that the curve in Figure 1 is truly quadratic in form and that this shape could be evidenced in a meticulous replication. A possible interpretation for this result would be in terms of an interactive effect of two separate phenomena: the
interference with consolidation (or retrieval mechanisms) in the earlier presentation, and a lessened importance of the primacy of first impression over time for the other groups.

A decrease in the primacy effect with time may help account for the observed result. If attention decrement (as discussed earlier) is the cause of this primacy effect then it would seem that the one hour respite for the T1 group was not long enough for Ss to regain their attentive capacities. This group was, in fact, least affected by the stimulus material. Such a finding makes the decrementation hypothesis less plausible but does not necessarily discount this interpretation.

Relationship of "Accuracy" to "Judgmental" Responses

It may be noted that, as predicted, the "accuracy" measures decreased with the measurement time incrementation, but not according to treatment condition. Furthermore, one of the "judgmental" measures ("identification") was influenced by the treatment conditions, but not by the measurement time variable.

It might be possible to construct a situation in which the two types of responses are related. As a "real life" example, it would not be difficult to imagine that the "fact" of the speed of an automobile involved in a traffic accident might be recalled differently when a witness is later presented with background information
about the defendant.

The exploration of dependencies between judgmental and "factual" aspects of different situations in memory seems worthwhile, since the findings may have implications for areas such as forensic psychology and studies in propaganda.
REFERENCES


Baumrind, D. Some thoughts on ethics of research: After reading Milgram's "behavioral study of obedience". Amer. Psychol., 1964, 19, 421-423.


APPENDIX

The two questionnaires given to the subjects at the testing sessions comprise this appendix.
As opposed to the "Small World" point of view held by the author, the other major theory that he mentions predicts that two people in different locales
(a) will not have a common link unless they are related
(b) will not have a common link unless by chance they circulate within the same group of acquaintances
(c) will very probably not have a common link of any kind
(d) will probably have a common link, but one that is very difficult for a researcher to identify
(e) none of these

In this communications study participants were likely to send folders to persons
(a) of the same sex
(b) of the opposite sex
(c) of a similar age
(d) of the same profession
(e) within the same general locale

The author was associated with which university?
(a) U. C. San Diego
(b) U. C. Berkeley
(c) U. of Maryland
(d) M. I. T.
(e) Harvard U.

The (median) average number of intermediate links between starting person and target person was
(a) two
(b) five
(c) ten
(d) twelve
(e) twenty-five

In studying the differences in communications between the races the author found
(a) black starters reached white targets with fewer links than vice versa
(b) white starters reached black targets with fewer links than vice versa
(c) actually, he did not have an opportunity to study racial differences
(d) among middle-class blacks and whites, black starters required about the same number of links to reach a
white target as did white starters to reach a black target.
(e) the (median) average number of links were fewer in northern cities than in southern cities.

The target person in this study, Jeffrey Travers, was a
(a) painter
(b) merchant
(c) stockbroker
(d) pawnbroker
(e) attorney

On what sort of budget did the author conduct this experiment?
(a) $156
(b) $680
(c) $1255
(d) $15,505
(e) $1540

According to a study by Michael Gurevitch, the average person comes in contact with about how many people in a 100-day period?
(a) 65
(b) 125
(c) 175
(d) 350
(e) 500

The starters were chosen from which two cities:
(a) Pomona and El Monte
(b) Orlando and St. Petersburg
(c) Kansas City and Little Rock
(d) Witchita and Omaha
(e) Dallas and Ft. Worth

The author cited a previous study by
(a) Pool and Kochen
(b) Sherif and Cantril
(c) R. Edwards
(d) A. Lorenzen
(e) Baum and Knudsen
PLEASE RATE THE FOLLOWING STATEMENTS ABOUT "THE SMALL WORLD PROBLEM" ON A 6-POINT SCALE AND PLACE THE NUMBER NEXT TO THE STATEMENT. SCORE AS FOLLOWS:

1 for strongly agree
2 for agree
3 for mildly agree
4 for mildly disagree
5 for disagree
6 for strongly disagree

1. The "Small World Problem" was well-designed and carefully planned
2. The author disrupted the lives of the people who helped him with his experiment
3. This study represents a major contribution to the field of social psychology
4. It would be difficult to try to generalize the results of this experiment to the "real world"
5. It would be worth-while for the author to do a follow-up study using the same methods but varying such elements as locale, distance, and economic class
6. The author omitted too many relevant variables and details
7. It would have been fun participating in this experiment as a subject
8. The results fail to provide sufficient support for the author's theory
9. This paper ("Small World") was well-written and is easy to read
10. The author should have used a larger sample with more controls
Compare the two papers you read in terms of interest value by rating them as follows:
1 very interesting
2 interesting
3 neutral impression
4 uninteresting
5 very dull
6 don't really recall

Small World Problem
Baumrind critique of "Behavioral Study of Obedience"

Please rate the following statements about Milgram's "Behavioral Study of Obedience" (the study criticized by Baumrind) on a 6-point scale as follows:
1 strongly agree
2 agree
3 mildly agree
4 mildly disagree
5 disagree
6 strongly disagree

Milgram's procedures were justified in terms of the scientific knowledge gained
Milgram was not able to properly "desensitize" his subjects after they discovered the purpose of his study
His findings are important

Milgram's subjects (in "The Behavioral Study of Obedience") underwent various symptoms of stress because of conflict when told to shock other people. In what ways did this stress manifest itself (list below, as many as you can remember)?

What is your opinion of Milgram's "Behavioral Study of Obedience" (please comment below)
Have you had any exposure to "The Small World Problem" or "Behavioral Study of Obedience" or Baumrind's critique of the latter paper outside of this experimental situation? Please explain if applicable.

The final portion of this questionnaire is optional. Please make any critical comment you wish about the experiment you just completed. When you are through, a brief explanation will be given of the purpose and your questions answered.