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CHAPTER I

INTRODUCTION

Statement of the Problem

Research in the area of creativity has enjoyed a remarkable upsurge since Guilford's (1950) APA Presidential Address. Considerable energy has been invested in attempts to define the term "creativity," to develop theoretical models to explain the creative process and to develop instruments to assess and predict creative thinking. Another line of investigation has explored psychological techniques for the facilitation of creative problem solving. Some of these techniques are as follows: brainstorming (Osborn, 1953; Parnes and Meadow, 1959; Parnes, 1961), synectics groups (Gordon, 1961), educational materials (Covington and Crutchfield, 1965; Ofton and Crutchfield, 1969; Torrance, 1965), and the method of association training (Maltzman, 1960). The present study is designed to explore the influence of massing of work sessions as a factor in the facilitation of original responses.

Massing as a facilitating technique has received little recognition in the literature. Massed vs. distributed practice has generated many studies in the experimental literature on learning, but has not been well explored in the area of thinking. Brainstorm-
In practice is somewhat similar as a technique to massing, but the facilitating effect of brainstorming is generally attributed to the lack of evaluation involved and not to the type of work session. Brainstorming encourages a greater number of ideas whether bad or good; its effectiveness in facilitating creativity is, therefore, attributed to the fluency it encourages. However, in that most brainstorming sessions are massed rather than distributed, the significant facilitating effect may in part be due to the massing. The present study explores the facilitating effects of massing in an evaluative context.

Mednick's (1962) theory of the associative basis of the creative process has served as the theoretical model within which the present study was conceived. In this model, Mednick defines creative thinking as "the bringing together of associative elements into new combinations which either meet specified criteria or are in some way useful." Rather than using the general term creativity, more specific terms such as uniqueness, fluency, and remote associational ability will be defined and used in the course of the dissertation. Hopefully, as suggested by Mednick, further laboratory analyses of experimentally manipulated variables will add clarity to the field.

Research Hypothesis and Rationale

The present study was designed to assess the effect of massing vs. distributing work sessions on the generation of original ideas in a structured problem solving situation. The influence of level of
remote associational ability and sex of subject on the effects of the experimental treatment are also considered.

The major research question underlying the present investigation is: Does massing of work in one session rather than distributing work into several shorter sessions have a facilitating effect on the generation of original ideas?

The study allows the testing of the following hypothesis: Massed work sessions will result in a greater number of unique responses than distributed work sessions. The hypothesis is a restatement of an earlier hypothesis proposed by Mednick (1962) that states that "total time of work being equal, massed sessions of creative work should be more successful than distributed sessions" (p. 230).

The rationale to support this hypothesis follows directly from Mednick's theory. First, the individual making use of the massed session technique is more likely to achieve temporal contiguity of the necessary associative elements within an intensive work session than an individual who has distributed his efforts in shorter work periods. Second, it may take some time for an individual to go beyond the obvious aspects of a problem. In the later stages of intensive work on a problem, the individual may begin to entertain more remote associations than are evoked by elements of the problem. It is among these remote associations that the key to the creative solution will lie.

Assumptions

It was assumed that the criterion measure, The Unusual Uses Test, validly assesses ideational fluency and originality associated with
ideational fluency. It was further assumed that the Remote Associates Test with the effect of intelligence removed is a valid measure of remote associational ability. No assumptions were made about the relationship between performance on the Remote Associates Test and The Unusual Uses Test.

Limitations of the Study

The present study is intended to be a laboratory experiment on the effects of manipulating work sessions over short periods of time on the generation of original and useful responses in a structured problem-solving situation. The study does not undertake to assess the effects of massed vs. distributed work sessions spread out over days. Distributing the sessions over days would be closer to the intent of Mednick's original hypothesis and closer to an approximation of the real life, problem solving situation. The problems of controlling subjects' behavior outside of the experimental situation (such as seeking answers from friends) made distributing the work sessions over days unfeasible. Without proper experimental controls, it would be difficult to successfully account for an experimental effect if one were found. Naturally, caution is indicated in generalizing from the controlled laboratory situation to problem solving in a naturalistic setting.

Definition of Terms

Creativity: The "bringing together of associative elements into new combinations which either meet specified requirements or are in some
way useful: (Mednick, 1962).

**Fluency:** Refers to the total number of responses emitted by each subject (Common plus Unique) in the Unusual Uses Test.

**Uniqueness:** Refers to the total number of responses emitted by each subject on the Unusual Uses Test that occurred only once in the present sample.

**Originality:** The term here refers to uniqueness. Both are measures based on the statistical infrequency of a given response occurring in a given population.

**Remote Associational Ability:** The ability of an individual to form associative elements into new combinations by providing mediating connective links as measured by The Remote Associate Test (RAT).

**High RAT - Low RAT:** Subjects whose RAT score were above the median of the sample were designated as High RAT subjects; subjects whose score were below this median were designated as Low RAT subjects.

**Massed Work Sessions:** Those sessions in which the subject is required to work for sixty minutes without interruption.

**Distributed Work Sessions:** Those sessions in which the subject is required to intersperse two twenty-minute rest periods between three twenty-minute work periods.

**Organization of the Dissertation**

Chapter I has presented a statement of the problem, the major hypothesis to be tested, assumptions and limitations of the investigation, and definitions of basic terminology used. Chapter II presents
a cursory review of the literature relevant to the present study.
Chapter III contains a description of the instrumentation and procedures used in the investigation. Chapter IV presents the analysis and results; Chapter V contains a discussion of the results. Chapter VI presents a summary of the investigation, implications, and suggestions for further study.
CHAPTER II

REVIEW OF THE LITERATURE

Massed vs. Distributed Practice

The experimental literature on massed vs. distributed practice sessions has generally concerned itself with the influence of this variable on the acquisition of certain responses. The exact meaning of "massed" and "distributed" varies greatly in the literature from a matter of seconds in verbal learning studies to several days in studies of complex problem solving. The experimental literature, however, deals with the process of acquisition rather than with problem solving or thinking. The present review will restrict itself to those studies of massed vs. distributed work sessions that deal primarily with thinking or problem solving or in some way relate directly to the present study. No studies reviewed have dealt specifically with divergent thinking.

Considerable theory has been developed to explain the apparent superiority of distributing learning trials. Woodworth and Schlosberg (1964) discuss ways in which beneficial forgetting may explain mastery and permanent retention through escape from interfering responses. The rationale for this hypothesis states that the "remote associations" formed in the first reading of a list of nonsense syllables or of a poem interfere with the complete ordered mastery
of the series or passage. Distributing practice allows the learner to weaken incorrect associations when making a fresh start after a period of rest. The reverse of the above rationale might be used to suggest that massing of work sessions may facilitate "remote associations" and hence be beneficial to original responding.

In studies that have shown an advantage for massing over spacing, the spacing has been wide, usually amounting to a day or more between sessions. The possibility remains that a rest period of shorter duration would have led to optimal performance. Research does indicate, however, that the disadvantage of wide spacing is greater for some tasks than for others.

Short sessions are one type of task that appears to especially suffer from wide spacing. Lyon (1917) found that it took less time to memorize a list of only 12 digits in continuous reading than in one reading per day. With longer sessions, the advantage shifted to daily readings and became great when the lists were extremely long (100-200 digits). Similarly, Pechstein (1921) and Cook (1928) found similar results with mazes of different lengths. Rats learn a short maze in fewer massed than widely spaced trials, but a long one in fewer trials, one per day, than massed. The important factor here is assumed to be forgetting which would be small with quick repetitions but considerable when trials were a day apart.

Lessons that demand much exploration to discover the correct response also seem to suffer from distributed sessions. Cook (1944) designed a "spider maze" with six blind alleys at each choice point.
Human subjects learned the maze more quickly in massed trials than with one trial per day. The same results were found with a "mental maze" which offers six choices at each choice point. Subjects were required to discover by trial and error which of the numbers 1-6 was the correct one. Results were attributed to the consequences of forgetting in such a situation. Similar results have been obtained by Garret (1940) and by Ericksen (1942).

Woodworth and Schlosberg (1964) predict the advantage of massed trials on another basis. The literature on exploratory activity indicates that there is a tendency to avoid immediate repetition of the same choice at a choice point. It is felt that massing should favor more complete exploration and avoidance of stereotyped errors. Therefore, massing should favor variability of attack on a problem. This prediction would only hold true if the trials are "noncorrection"; with correction the varied attack occurs in a single trial, whether massed or spaced.

For a further review of the experimental literature, most of which is peripheral to the present study, the reader is referred to Woodworth and Schlosberg (1964). Conclusions from the literature are difficult to apply to practical situations. Continuous work on a problem may facilitate variability of attack or it may have just the opposite effect; the subject may get into a monotonous rut from which escape would require a rest from the particular problem. Both massing and wide spacing could give a varied attack on a difficult problem -- massing because of the avoidance of stereotyped answers,
spacing because of the factor of beneficial forgetting. Which condi-
tion would have a more facilitative effect would appear to be a func-
tion of the particular problem solving task.

Techniques for Facilitating Original Responses

Maltzman (1960) and Wallach (1970) both have extensive reviews
of the literature on experimental techniques for increasing original-
ity. The reader is referred to these reviews for a detailed discuss-
ion of work done in this area. The present review will restrict
itself to those studies that are directly related to the present
investigation.

Among early attempts at the training of originality is the
technique of brainstorming discussed by Osborn (1957). The procedure
is one of free-association with emphasis upon producing large numbers
of "ideas" in the absence of criticism or judgments as to their value.
Critical evaluation is delayed in order to avoid inhibiting unusual
ideas during the session.

Parnes and Meadow (1959) found that a course based on Osborn's
principles produced a significant increment in originality in its
students as compared to a control class taking a different course.
The study, however, is methodologically weak; no control for differ-
ences in motivation, or for extent of differential rehearsal of test
materials in the experimental and control classes was made. In that
the "creative problem solving" course was an elective one, subject
selection was also biased.
Parnes (1961) found that more good ideas appear in the last half of a subject's total idea output regarding a creative thinking problem than during the first half. The criterion measure for creativity was uniqueness ratings for uses of a coat hanger (Harris and Simberg, 1954), a measure that correlates .47 with Guilford's (1950) Unusual Uses Test. Subjects were given five minutes to work on the problem. The results were interpreted as indicating that extended effort in producing ideas on a creative thinking problem tends to reward subjects with a greater proportion of good ideas in the second half of their total output. A strong relationship was found between quantity and quality of ideas.

In a second experiment, Parnes (1961) investigated whether the type of results he found in the first experiment with untrained subjects would also occur with subjects trained in the brainstorming principle of deferred judgment. Uniqueness rating on the hanger problem were again used as the dependent variable, but the time limit was extended to fifteen minutes in order to see if a trend could be observed toward increasingly greater proportions of good ideas as a subject's total number of responses increases. Analysis was made by dividing the subject's total number of responses into thirds. The findings showed that significantly more good ideas appear in the final third, rather than in either of the first two-thirds of the subject's idea list. Results were again interpreted as indicating that extended effort in producing ideas on a creative thinking problem tends to reward problem solvers with a greater proportion of good ideas in the later part of their lists.
It may be noted in both of the Parnes experiments that single intensive work sessions are used. The possible influence of distributing work sessions over a period of time is not discussed here or elsewhere in the brainstorming literature.

The work on training of originality by Maltzman and his associates is directly related to the present investigation. Both Maltzman's work and the present study are concerned directly or indirectly with facilitating uniqueness of ideational content on the Unusual Uses Test. In an early experiment, Maltzman, Bogartz, and Breger (1958) found that having the subject repeatedly make different associations to the same stimulus word led to more original responses on a test list.

In a later study, Maltzman, Simon, Raskin and Licht (1960) found that the associative training procedure of evoking different responses to the same stimuli was successful in facilitating uniqueness of ideational content on the Unusual Uses Test. These results are best explained in terms of the associative hierarchy conception of individual differences in creative problem-solving ability.

The associative hierarchy conception as elaborated by Mednick (1962) states that highly creative subjects respond on an associative task at a slower rate and emit many responses (flat hierarchy) while low creative subjects respond at a higher rate but emit fewer responses (steep hierarchy). Following the associative hierarchy rationale, the greater the concentration of associative strength in a small number of stereotyped responses, the less likely it is that the individual will attain a creative solution.
It is assumed that the Maltzman procedure of association training leads to flattening of the associative gradient and therefore to greater productivity of unique ideational content. The present study deals with individual differences in associative gradient and explores the possibility of their being a differential effect of massed vs. distributed work sessions with relatively steep and relatively flat associative hierarchy gradients.

Another line of research directly related to the present study deals with the facilitation of performance on the Remote Associates Test (RAT), an instrument specifically designed to assess the slope of the associative hierarchy gradient. Freedman (1965) contrasted the effects of three kinds of experience upon subsequent measured RAT performance levels: generating associations to the words, reading the associations produced by others to stimulus words, and defining stimulus words. Significantly higher RAT scores were obtained by subjects in the first condition than by subjects in either of the other two conditions. The facilitating effect of the free associative training was attributed to the facilitation of plentiful associates and hence relatively uncommon ones.

An earlier study by Caron, Unger, and Parloff (1963) had failed to obtain facilitation of RAT performance from an associative training condition. Freedman (1965) points out that his facilitation procedure is more likely to result in greater remoteness from the stimulus word than the procedure used by Caron et al. Unlike Caron who repeated the stimulus word each time a new associate to it was produced, Freedman presented the stimulus word only once, with all the subjects'
associations following. The Caron technique was thought to keep the
associations more closely linked to the stimulus words than the
Freedman technique; hence the Freedman technique was thought to re-
sult in a flatter gradient and, therefore, a greater number of unique
responses relative to the stimulus words.

Although considerable work has been done on the development
of facilitation techniques, relatively little work has been concerned
with the study of individual differences in the effectiveness with
which various subjects use various techniques. Gall and Mendelsohn
(1967) found interesting sex differences in a study investigating the
relative effectiveness of three facilitating techniques for increasing
performance on the RAT. First, male experimenters were able to
facilitate more problem solutions than were female experimenters.
Second, an association training procedure was effective for female
subjects but not for males. And third, the problem-solving behavior
of females was strongly influenced by social factors in the experimental
situation, while the performance of males could only be related to the
particular facilitation technique they were instructed to use.

In a more recent study, Mendelsohn and Gall (1970) investigated
personality differences between those subjects whose creative problem-
solving performance was facilitated and those whose performance was
not. Two groups were formed on the basis of relative enhancement of
performance on five target RAT items following exposure to a modifi-
cation of Maltzman's association technique. For females, the effect
of personality was contingent on the sex of the experimenter. Low-
facilitation female subjects interacting with male experimenters appeared dissatisfied with themselves and others and ill at ease in social situations. No differences were found between low-facilitation and high-facilitation females matched with female experimenters. Results were discussed in terms of the interaction between personality traits and social contexts.

The review of the literature on techniques for facilitating original responding has been restricted to those studies most closely related to the present research. The studies closest in content to the analysis of the effects of massing were those in the literature on brainstorming. Other studies on association training all evolved from the associative hierarchy conception of individual differences in creative problem solving. Some studies on individual differences in the effectiveness of facilitating techniques, particularly those dealing with sex differences, were reviewed.
CHAPTER III

METHODOLOGY

Instrumentation

The instruments used in subject selection were the Remote Associates Test -- College and Adult Form I (Mednick and Mednick, 1967) and the Quick Word Test -- Level II, Form AM (Borgatta and Corsini, 1964). The criterion measure was an Unusual Uses test devised by Guilford and his associates (1950).

The Remote Associates Test

Mednick (1962) designed The Remote Associates Test (RAT) to operationalize his definition of creative thinking as "the forming of associative elements into new combinations which either meet specified requirements or are in some way useful." The test requires the individual to form associative elements into new combinations by providing mediating connective links. Since the test situation is contrived, the combination must meet specified criteria that are experimenter-imposed.

The test items consist of sets of three words drawn from mutually remote associative clusters. An example would be:

cookies sixteen heart

The subject is required to find a fourth word which functions as a specific associative link between these words. The answer here
"sweet." Cookies are sweet; sweet is part of the expression "sweet sixteen" and part of the word "sweetheart." The subject is given several examples so that he has an adequate opportunity to achieve the specific set necessary for the task. Forty minutes are allowed for completion of this thirty-item test.

Mednick (1962) reports a Spearman-Brown, odd-even reliability coefficient on the RAT of .92 in one sample (289 women, almost all the students at an Eastern women's college, tested as part of a project under the direction of Theodore Newcomb) and .91 in another (215 men tested at the University of Michigan as part of a project under the direction of Warren T. Norman). Attempts at concurrent validation of the RAT have generally taken the form of relating RAT scores to assessments of research creativity, a measure which itself possesses only high face validity. Mednick (1962) reports a correlation of .70 between scores on an early form of the RAT and ratings of creativity by faculty members of the College of Architecture, University of California, Berkeley. In a second study, Mednick (1963) reports a correlation of .55 between RAT scores and ratings of psychology graduate students' research creativity by faculty supervisors at the University of Michigan. Dodd (1962) and others report significant relationships between RAT and ratings of products.

Regarding correlations with intelligence assessors, Mednick (1963) reports a correlation of .41 between RAT performance and Miller Analogies Test scores for a sample of psychology graduate
students. For undergraduates, Mendelsohn and Griswold (1966) obtained a correlation of .35 between RAT and the vocabulary test of the Institute of Educational Research Intelligence Scale (Thorndike, 1942), and Laughlin (1967) reported a correlation of .48 between RAT and Terman's Concept Mastery Test. The strong relationship between RAT and intelligence measures in the literature may be accounted for by shared method variance and the reasonable expectation that size of vocabulary would play an important role in RAT performance.

Mendelsohn and Griswold (1966) indicate that it is the intelligence-free part of the RAT variance that accounts for its relationship with measures of incidental cue utilization. Wallach (1970) speculates that the intelligence-free variance of the RAT is its link with associative productivity and uniqueness. With this in mind, it was thought that appropriate controls for intelligence should accompany the RAT.

The Quick Word Test

The Quick Word Test (Borgatta and Corsini, 1964), is a convenient group-administered test of general intelligence that shows an impressive correlation ($r = .85$) with the verbal scale of the Wechsler Adult Intelligence Scale. The QWT was chosen because it is essentially a vocabulary measure and highly similar to RAT in manner of presentation. The test correlates .83 with the total Wechsler Adult Intelligence Scale, .78 with the Kehlman-Anderson Intelligence Test, and .84 with the Lorge-Thorndike Intelligence Tests: Level 5. The authors report a Spearman-Brown, split-half reliability
coefficient of .90 for a sample of college freshmen. The test consists of 100 vocabulary items. The subject must choose one word in four which means the same as the first word in the list. There is no penalty for guessing and no time limit.

In an independent analysis of The Quick Word Test, Grotelueschen and Knox (1967) found the measure to be very reliable and seemingly valid as an estimate of adult mental ability. Subsets of as few as fifteen QWT items have demonstrated a correlation greater than .60 with the WAIS. They recommend the test for situations in which control for mental abilities is warranted and the administration of more comprehensive scales would not be practical.

The Unusual Uses Test

Guilford and his associates (1950) developed the Unusual Uses Test to measure ideational fluency and originality. Wallach (1970) indicates that ideational fluency is the most clearly supported dimension of individual differences independent from convergent thinking that is also cohesive in its own right. He further indicates that originality as a dimension independent of intelligence must be restricted to that originality that is facilitated by ideational fluency. The Unusual Uses Test is designed to assess both of these dimensions.

The test consists of six common items -- an automobile tire, a key, a safety pin, a watch, a button, and eyeglasses. The test yields both a measure of fluency (number of uses) and of uniqueness (number of uses occurring only once in the sample). Norms have been published
on the uniqueness of items on the test by Maltzman, Simon, Raskin, and Licht (1960).

A strong relationship is generally found between fluency and uniqueness measures although the meaning of the relationship is not clear. For Wallach (1970) creativity is defined in terms of "the person's ability to generate in plentiful number ideas that are appropriate to a given task constraint." Others such as Clark and Mirels (1970) suggest that fluency, defined as number of responses, may misleadingly influence the high correlations reported among measures of creativity. Therefore, to a certain extent the relationship between fluency and uniqueness is inherent in the construct of creativity and to a certain extent fluency is a factor that should be controlled for when considering originality. Noting this ambiguity, results involving the Unusual Uses Test should be analyzed both with uniqueness and fluency as dependent variables and with uniqueness controlled for fluency as the single dependent variable.

Experimental Design

The present study employed a 2 x 2 x 2 factorial design where relevant factors were: sex, massed vs. distributed work sessions, and level of remote associational ability.

The dependent variables in one analysis were fluency and uniqueness scores on the Unusual Uses Test. In a second analysis, uniqueness was the dependent variable with fluency scores used as a covariate. In a third analysis, uniqueness alone was again the
dependent variable, but both fluency and QWT scores were used as co-
variates.

**Subjects**

Eighty undergraduates enrolled in Introductory Psychology at The Ohio State University served as subjects. One hundred and thirteen subjects were screened.

**Subject Selection**

Prospective subjects were given 1) The Remote Associates Test (RAT) and 2) The Quick Word Test (QWT). A median split was made on RAT scores with the top half being designated the High-RAT group (N = 40) and the bottom half the Low-RAT group (N = 40). Then subjects in each group were divided by sex yielding groups of twenty males and twenty females at each RAT level. Subjects were then matched by sex and individual RAT score into two matched groups. The end result was eight treatment cells of equal size (N = 10).

Two screening sessions were conducted with the order of presentation of The Quick Word Test and The Remote Associates Test counterbalanced. One male subject in the Low-RAT-massed condition failed to report for the second part of the experiment. A later screening session was conducted to replace this subject with an individual with the same Remote Associates Test score.
Criterion Measure

The dependent variable in the present study was performance on an Unusual Uses Test consisting of those items selected by Maltzman and his associates (1960) -- an automobile tire, a key, a safety pin, a watch, a button, and eyeglasses. Subjects were instructed to write down as many different ways as they could think of that each object could be used. Each was instructed to be as original as he wished but to be sure that each response was in some way useful as well. The examples and instructions given each subject were similar to those given by Wallach and Kogan (1965) in their test of Alternate Uses.

Two judges were trained and independently scored the tests. Responses were typewritten and coded before given to the judges to insure that handwriting and knowledge of sex of subject would not influence the judges' ratings. Interjudge reliability for fluency was 1.00 and for uniqueness .92. The sum of the two judges' ratings were used as data in the statistical analyses. Responses were scored as common if they appeared more than once and unique if they occurred only once in the current sample. The experimental instructions, the test, and a listing of the norms developed from the present study may be found in the Appendix.

Experimental Treatment

The type of work session experienced was manipulated in the present study. Two conditions were employed: Massed (one sixty-
minute session) and Distributed (three twenty-minute sessions: 20 min. work -- 20 min. rest -- 20 min. work -- 20 min. rest -- 20 min. work). In the Distributed conditions subjects were given two 20 minute rest periods between trials during which time they were free to do as they pleased. Testing was individual and all six items were presented at the beginning of the experiment to each group. Subjects were free to work on any items in any order or method they desired. The experimental instructions were presented both orally and in writing to each subject.
CHAPTER IV

RESULTS

Before presenting evidence specifically testing the main hypothesis, descriptive statistics will be presented to clarify later results. Means and standard deviations of the various treatment groups' performance on the screening and criterion measures are presented in Table 1. Matching of subjects by sex and RAT score left little difference between the means and standard deviations of performance within the High and Low RAT groups on the RAT. Performance on the Quick Word Test like that on the RAT shows little difference within the High and Low RAT groups but considerable difference between the two groups.

Fluency scores do not differ widely between treatment groups with the exception of the Low RAT Massed-Female group which differs significantly from the Low RAT Distributed-Female group \( t = 2.12, p < .05 \) and Low RAT Distributed-Male group \( t = 2.12, p < .05 \) and the High RAT Distributed-Female group \( t = 3.62, p < .01 \) and High RAT Distributed-Male group \( t = 2.38, p < .05 \). This result is interesting in itself and will be brought up in the discussion section. None of the other groups significantly differ from one another.

Uniqueness scores appear to be skewed in their distribution
### TABLE 1

Description of Treatment Groups on Screening and Criterion Measures

<table>
<thead>
<tr>
<th>Treatment Group</th>
<th>RAT</th>
<th>QWT</th>
<th>Fluency</th>
<th>Uniqueness</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>High RAT</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Massed-Male</td>
<td>19.50</td>
<td>1.58</td>
<td>57.00</td>
<td>10.23</td>
</tr>
<tr>
<td>Massed-Female</td>
<td>19.60</td>
<td>2.63</td>
<td>50.80</td>
<td>13.55</td>
</tr>
<tr>
<td>Distributed-Male</td>
<td>19.50</td>
<td>2.01</td>
<td>53.30</td>
<td>13.33</td>
</tr>
<tr>
<td>Distributed-Female</td>
<td>19.60</td>
<td>2.41</td>
<td>58.00</td>
<td>16.49</td>
</tr>
<tr>
<td>Low RAT</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Massed-Male</td>
<td>11.30</td>
<td>3.50</td>
<td>46.90</td>
<td>9.80</td>
</tr>
<tr>
<td>Massed-Female</td>
<td>10.40</td>
<td>3.69</td>
<td>42.80</td>
<td>12.13</td>
</tr>
<tr>
<td>Distributed-Male</td>
<td>11.10</td>
<td>3.81</td>
<td>45.70</td>
<td>10.67</td>
</tr>
<tr>
<td>Distributed-Female</td>
<td>10.40</td>
<td>3.86</td>
<td>45.80</td>
<td>11.47</td>
</tr>
<tr>
<td>Total Group Means</td>
<td>15.18</td>
<td>5.90</td>
<td>50.04</td>
<td>12.95</td>
</tr>
</tbody>
</table>

N >
at least in the Low RAT condition. Three of the four standard deviations in the Low RAT group are larger than the cell mean. Extremely high scores by two male subjects, one in the massed and one in the distributed condition account for most of this effect. Some caution is therefore warranted in any statistical analysis or interpretation with RAT level and with sex.

Hartley's test of homogeneity of variance in Uniqueness scores indicated that this assumption was met for analysis of the massing treatment effects but not for the analysis by sex or by RAT level. In that the main research hypothesis only concerns itself with the effects of the massing treatment, it was decided that a separate analysis by sex and by RAT level rather than a regular three-way analysis of variance would be appropriate.

A summary of correlations between the screening and criterion measures is presented in Table 2. As anticipated, the relationship between RAT and QMT was highly significant ($t = 4.32, p < .001$). In light of the findings of Mendelsohn and Griswold (1966) and the recommendation of Wallach (1970), it was decided that QMT scores should be covaried in analyses involving the RAT.

The correlation between Fluency and Uniqueness was also expectedly high ($t = 14.38, p < .001$). Recall that the meaning of the relationship between Fluency and Uniqueness is not clear. Following Wallach (1970), where fluency is an essential part of the creativity construct, both Fluency and Uniqueness were analysed as dependent variables. A second analysis followed from Clark and
<table>
<thead>
<tr>
<th></th>
<th>RAT</th>
<th>QWT</th>
<th>Fluency</th>
<th>Uniqueness</th>
</tr>
</thead>
<tbody>
<tr>
<td>RAT</td>
<td>1.0000</td>
<td>0.4395*</td>
<td>0.0868</td>
<td>-0.0653</td>
</tr>
<tr>
<td>QWT</td>
<td></td>
<td>1.0000</td>
<td>0.0452</td>
<td>0.1590</td>
</tr>
<tr>
<td>Fluency</td>
<td></td>
<td></td>
<td>1.0000</td>
<td>0.7442*</td>
</tr>
<tr>
<td>Uniqueness</td>
<td></td>
<td></td>
<td></td>
<td>1.0000</td>
</tr>
</tbody>
</table>

*p < 0.001
Hirels (1970) rationale for removing the influence of fluency. In the second analysis, uniqueness alone was the dependent variable and fluency scores were used as covariates.

A summary of the analysis of the effects of massing for the entire sample is presented in Table 3. As previously mentioned, a multivariate analysis had been planned but lack of homogeneity of variance between RAT levels and between sexes seemed to warrant collapsing the data and running a series of univariate tests. The analysis of variance on Uniqueness alone indicated that no difference in mean number of unique responses was found between the massed and distributed conditions. The analysis of variance on Fluency scores alone indicated that the total number of responses was greater in the distributed condition than in the massed condition although the difference falls short of statistical significance. In a second analysis, appropriate control for the effects of fluency was desired; therefore, an analysis of covariance was performed on Uniqueness with Fluency as a covariate. With such an analysis, the test of the hypothesis fell just short of significance (p < .10, one tailed test).

Recall that the QMT was given because control for mental ability seemed warranted and the administration of more comprehensive scales did not seem practical. In a third analysis of the data, the influence of IQ as well as fluency was removed by means of an analysis of covariance with fluency and IQ as covariates. With such an analysis, the research hypothesis concerning the facilitating effect
TABLE 3  
Summary of Analysis on the Effects of Massing in the Total Sample

Analysis of Variance: Uniqueness

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment (M)</td>
<td>1</td>
<td>.200</td>
<td>.001</td>
</tr>
</tbody>
</table>

Analysis of Variance: Fluency

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment (M)</td>
<td>1</td>
<td>400.375</td>
<td>1.893</td>
</tr>
</tbody>
</table>

Analysis of Covariance: Uniqueness with Fluency as a Covariate

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment (M)</td>
<td>1</td>
<td>377.977</td>
<td>2.511</td>
</tr>
</tbody>
</table>

Analysis of Covariance: Uniqueness with Fluency and QWT as Covariates

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment (M)</td>
<td>1</td>
<td>415.703</td>
<td>2.838*</td>
</tr>
</tbody>
</table>

*p < .05 (one tailed test)
of massing was supported with a one-tailed test ($t = 1.79, p \leq .05$).

For the total sample, the hypothesis concerning the facilitating effect of massing of work sessions was supported by a one-tailed test of significance when both fluency and IQ were used as covariates. Caution is warranted in interpreting these results.

In that the literature on facilitating effects suggests the existence of sex differences (Gall and Mendelsohn, 1967; Mendelsohn and Gall, 1970), a separate analysis of the effects of massing was made by sex. The results of the analysis of the effects of massing for males is presented in Table 4. None of the F-tests reached significance, indicating that the hypothesis of massing as a facilitating technique could not be supported for males even when the effects of intelligence and fluency were covaried.

An analysis of the effects of massing for females is presented in Table 5. Neither the analysis of variance on uniqueness nor fluency was statistically significant. However, when fluency was covaried from the analysis of uniqueness, the research hypothesis was supported ($p \leq .05$, two-tailed test). In a further analysis where fluency and IQ were used as covariates, the effect was even greater with the one-tailed test narrowly missing significance at the .01 level. When fluency or fluency and intelligence are covaried, the hypothesis of massing as a facilitating technique was supported for females.

Mednick's (1962) Theory and the rationale for the Remote Associates Test warranted a separate analysis on the High RAT and
### TABLE 4

Summary of Analysis on the Effects of Massing for Males

**Analysis of Variance: Uniqueness**

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment (M)</td>
<td>1</td>
<td>.400</td>
<td>.001</td>
</tr>
</tbody>
</table>

**Analysis of Variance: Fluency**

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment (M)</td>
<td>1</td>
<td>532.891</td>
<td>.196</td>
</tr>
</tbody>
</table>

**Analysis of Covariance: Uniqueness with Fluency as a Covariate**

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment (M)</td>
<td>1</td>
<td>52.848</td>
<td>.234</td>
</tr>
</tbody>
</table>

**Analysis of Covariance: Uniqueness with Fluency and QWT as Covariates**

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment (M)</td>
<td>1</td>
<td>23.914</td>
<td>.111</td>
</tr>
</tbody>
</table>
### TABLE 5

Summary of Analysis on the Effects of Massing for Females

#### Analysis of Variance: Uniqueness

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment (M)</td>
<td>1</td>
<td>1.600</td>
<td>.010</td>
</tr>
</tbody>
</table>

#### Analysis of Variance: Fluency

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment (M)</td>
<td>1</td>
<td>4409.980</td>
<td>2.774</td>
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</tbody>
</table>

#### Analysis of Covariance:
Uniqueness with Fluency as a Covariate

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment (M)</td>
<td>1</td>
<td>269,437</td>
<td>4.116*</td>
</tr>
</tbody>
</table>

#### Analysis of Covariance:
Uniqueness with Fluency and QWT as Covariates

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment (M)</td>
<td>1</td>
<td>327,383</td>
<td>5.399*</td>
</tr>
</tbody>
</table>

*P < .05
Low RAT subjects. A summary of the effects of massing on High RAT subjects is presented in Table 6. As in all the previous analyses, no significance was found in either the Uniqueness or Fluency measures. However, as with females, significant differences were found in both the analysis of covariance with fluency and fluency and IQ as covariates for High RAT subjects. In both cases these are one-tailed tests of significance (p < .05).

A summary of the analysis of the effects of massing on the Low RAT subjects is presented in Table 7. In the case of the Low RAT subjects, none of the analyses indicated a significant effect. The hypothesis of the facilitating effects of massing, therefore, was supported only for High RAT subjects and only when fluency or both fluency and intelligence were used as covariates.
### TABLE 6
Summary of Analysis on the Effect of Massing on High RAT Subjects

#### Analysis of Variance: Uniqueness

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment (M)</td>
<td>1</td>
<td>119.024</td>
<td>.771</td>
</tr>
</tbody>
</table>

#### Analysis of Variance: Fluency

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment (M)</td>
<td>1</td>
<td>518.383</td>
<td>.289</td>
</tr>
</tbody>
</table>

#### Analysis of Covariance: Uniqueness with Fluency as a Covariate

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment (M)</td>
<td>1</td>
<td>236.275</td>
<td>2.747*</td>
</tr>
</tbody>
</table>

#### Analysis of Covariance: Uniqueness with Fluency and QWT as Covariates

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment (M)</td>
<td>1</td>
<td>265.263</td>
<td>3.203*</td>
</tr>
</tbody>
</table>

*p < .05 (one tailed test)*
TABLE 7
Summary of Analysis on the Effects of Massing on Low RAT Subjects

Analysis of Variance: Uniqueness

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment (M)</td>
<td>1</td>
<td>105.624</td>
<td>.194</td>
</tr>
</tbody>
</table>

Analysis of Variance: Fluency

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment (M)</td>
<td>1</td>
<td>4452.039</td>
<td>1.786</td>
</tr>
</tbody>
</table>

Analysis of Covariance:
Uniqueness with Fluency as a Covariate

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment (M)</td>
<td>1</td>
<td>223.141</td>
<td>1.213</td>
</tr>
</tbody>
</table>

Analysis of Covariance:
Uniqueness with Fluency and QVT as Covariates

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment (M)</td>
<td>1</td>
<td>252.734</td>
<td>1.505</td>
</tr>
</tbody>
</table>
CHAPTER V

DISCUSSION

Although interesting, the results suggest more questions than answers. Support was found for the main research hypothesis on the entire sample only when intelligence and fluency were both used as covariates. Virtually no differences were found between the massed and distributed conditions on the uniqueness measure alone. The finding of a significant effect of the massing treatment is restricted to females and High RAT subjects where fluency and intelligence were used as covariates. Unrestricted generalizations regarding the effects of massed work sessions on the generation of original ideas are not warranted.

One interpretation of the significant effect of massing for females and High RAT subjects follows from Mednick's theory and the rationale for the original research hypothesis. In accordance with this theory, the results would be explained by assuming that the subjects whose work sessions were massed were able to attain greater temporal contiguity of associative elements than those whose efforts were distributed over shorter work periods. Perhaps as also suggested in the rationale for the research hypothesis, remote associations evoked by a problem are only reached in the later stages of intensive work on that problem. It would be among these remote associations that the creative solution would be
found. A close inspection of the results, however, would support other interpretations as well.

The finding of sex differences in the present study is interesting. On the basis of limited evidence from previous studies one would expect that if massing were a facilitating technique its effect would be more pronounced with male than with female subjects. The results, however, suggest just the opposite with massing having a significant effect for females but not for males.

Mendelsohn and Gall (1970) report that the effectiveness of facilitating techniques is related, in part, to the sex of the subject interacting with the sex of the experimenter. In particular, females were strongly influenced by social factors in the experimental situation when interacting with a male experimenter. In the present study, a male experimenter was used throughout and the criterion measure was individually administered.

Furthermore, Mendelsohn and Gall (1970) found that when females were separated into groups of those whose problem-solving on five target RAT items was enhanced (high-facilitation group) and those whose performance was relatively unaffected by the facilitating technique (low-facilitation group), significant differences in personality as measured by the Adjective Check List (Gough and Heilbrun, 1965) were evident. The low-facilitation group was found to have significantly lower self-esteem than the high facilitation group.

These authors suggest that for females the stress of the heterosexual social interaction situation lessens the effectiveness
of the facilitation technique. If this suggestion is correct and if massing is a facilitating technique, then the performance of females should be less facilitated than that of males. The present results, however, indicate that just the opposite is the case when uniqueness is the criterion measure and the influence of fluency is removed.

Another way of looking at the data in the present study is in terms of fluency as the criterion measure, and here limited agreement with the Mendelsohn and Gall results is found. Going back to Table 1, note that the Low RAT, Massed-Female group differs significantly from four other groups in fluency. If Low RAT scorers were to be also low in self-esteem, then the greater negative effect of the heterosexual social situation might in part explain the significantly smaller output of the Low RAT females in a single intense work situation. A study further investigating the influence of self-esteem, RAT level, and sex-experimenter interaction seems warranted.

Fluency is the key factor in the interpretation of sex differences. Note that for females the mean number of unique responses is nearly the same under both treatment conditions (massed = 7.54; distributed = 7.50). The significant effect found for massing with females when fluency and intelligence are covaried must then somehow relate to these other factors.

In Wallach's (1970) model of creative thinking, what matters most in creative problem-solving is the generation of associates; once produced, evaluation and action are thought to produce little difficulty. Fluency as defined in the present study (total number
of responses) does not differ significantly as the result of the experimental treatment although the direction of difference clearly favors the distributed condition. This raises some interesting possibilities.

Perhaps with females the rest periods allow more time to think up other conventional uses the subject may recall from previous experiences with these objects, thus facilitating common responses but no unique ones. An analysis of variance on the number of common responses generated by females (fluency minus uniqueness scores) indicates that this is the case. Significantly more common responses ($F = 5.456, p < .05$) were generated when work sessions were distributed. This effect did not hold true for males ($F = .208$). The exact meaning of the separate analysis by sex is not very clear. Results may be interpreted as distributing work sessions facilitating a greater number of unique responses relative to common ones. Considering the size of the sample ($N = 80$), the resulting criterion of statistical infrequency for uniqueness is probably not as stringent as it would be in a larger sample. Had the size of the sample been larger, the treatment effect would likely have been more pronounced.

The possibility remains that the sex differences in the present study were a result of the items uses -- an automobile tire, a key, a safety pin, a watch, a button, and eyeglasses. No sex differences have previously been reported with this test (Guilford, 1950;
Maltzman et al., 1960), but a separate item analysis might help answer this question.

The results of the separate analysis of the High RAT and Low RAT group indicated that massing had a significant effect for the High RAT group (one-tailed test) but not for the Low RAT group when fluency is used as a covariate. These results seem to depend less on fluency than those for the separate analysis by sex. Here again, however, differences in the mean number of unique responses do not entirely account for the significant results (massed = 7.28; distributed = 5.37) at the High Rat level. Nor does the generation of number of common responses (High RAT: F = .797; Low RAT: F = 2.630) explain the results. A combination of these two factors is needed to account for the variance.

That significant effects for massing would be found at the High RAT level and not at the Low RAT level could be predicted from Mednick's theory. The entire theory and the Remote Associates Test which follows from the theory are based on the associative hierarchy conception of individual differences in creative problem-solving. This conception is supported by Bousfeld, Sedgwick, and Cohen (1954) who found a highly negative correlation between rate of association and total number of associations in a mathematical analysis of associative production. Accordingly, Mednick hypothesizes that highly creative people (flat hierarchy) would respond at a slower rate and emit many responses while low creative subjects (steep hierarchy)
would respond at a higher rate but emit fewer responses. Following the associative hierarchy rationale, the greater the concentration of associative strength in a small number of stereotyped responses, the less likely it is that the individual will attain a creative solution.

If it is assumed that RAT measures the slope of the associative hierarchy as it is intended to, the failure of massing to produce a facilitating effect on the Low RAT subjects (steep hierarchy) could be explained by their having exhausted their associations very quickly in both the massed and distributed conditions. The data, however, do not indicate a significant difference in fluency between the High and Low RAT groups although the direction of difference is in favor of the High RAT group. Further research on the relationship of the associative hierarchy notion to performance on the criterion measures of fluency and uniqueness is warranted.
CHAPTER VI

SUMMARY AND RECOMMENDATIONS

Summary

The present study was designed to investigate the effects of massed vs. distributed work sessions on the generation of original responses. Specifically, the hypothesis that massing of work sessions would facilitate a greater number of unique responses in a structured problem-solving situation was tested. The dependent variable was performance on the Unusual Uses Test (Guilford, 1950) scored for fluency (number of responses) and uniqueness (number of responses occurring only once in the sample). Two judges were trained to score the test, and interjudge reliability of .92 for uniqueness and 1.00 for fluency ratings were obtained.

Eighty undergraduate subjects were matched by sex and scored on Mednick's (1962) Remote Associates Test (RAT) and assigned to two treatment conditions. The massing treatment consisted of one sixty-minute work session; the distributed treatment of three twenty-minute sessions spaced by twenty minute rest periods. A median split on RAT scores yielded a High-RAT group and a Low-RAT group.

An analysis of variance of the effect of the massing treatment on the uniqueness measure was significant for the entire sample.
(p < .05) when both fluency and intelligence as measured by the Quick Word Test were used as covariates. A separate analysis by sex indicated a significant effect for massing with female subjects but not with male subjects when fluency or both fluency and intelligence were covariates; a separate analysis by level of remote associational ability indicated a significant effect for massing at the High RAT level but not the Low RAT level when fluency or both fluency and intelligence were used as covariates.

Interpretation of the separate analysis by sex focused on the influence of fluency. Distributing rather than massing work sessions resulted in a significantly greater number of common responses for females (p < .05) but not for males. Interpretation of the separate analysis by level of remote associational ability focused on the associative hierarchy conception of individual differences in problem solving. It was suggested that a relatively flat associative gradient may be needed for massing to have a facilitating effect. No specific conclusions and no practical implications seemed warranted, but several avenues of further investigation were suggested.

Recommendations for Further Study

Sex-experimenter interaction was thought to have a possible influence in the finding of significant results for females but not for males in the present study. Had the female subjects been run by
a female experimenter, the sex differences might not have been found. Level of self-esteem may be operating as a mediating link in the obtained results. A study along the lines of Mendelsohn and Gall (1970) with sex-experimenter interaction and level of self-esteem as factors and massing once again the facilitating technique would help clarify the present findings. Hopefully, such a study would result in a better understanding of the possible interaction of both of these factors in the obtained sex differences in the present study.

Another possible study suggested by the present results would entail a separate item analysis by sex of the Unusual Uses Test with a priori predictions of sex differences by item. In part, such an experiment could explore the relationship between functional fixedness and ability to generate unusual uses. For example, would females be more original with their use of an automobile tire and males more original with their use of a safety pin? In such a study, sex-experimenter interaction could either be controlled or used as an independent variable.

A third study suggested by the present results would assess the validity of the Remote Associates Test and the associative hierarchy notion on which it is based by separately analyzing the fluency and uniqueness of each twenty minute period within the distributed condition. If the predictions of associative hierarchy conception hold and if the Remote Associates Test is a valid measure of this concept, then High RAT subjects should be superior to Low
RAT subjects in fluency and uniqueness in the second and even more superior in the third twenty-minute session of the distributed condition. Appropriate controls for intelligence and sex-experimenter interaction would again be suggested.

Still another possible study would investigate the optimum rest periods or optimum length of massed work periods. Warden (1923) found in a maze experiment with rats a 12-hour interval came out better than either 6 or 24-hour periods. A study varying length of rest periods from very short periods such as the twenty-minute one in this study to rather long ones of up to 48 hours might help answer the question of the relative effect of distributing work sessions over longer periods. The question of optimum length of massed work sessions for generating original responses is a worthwhile variable to investigate. An analysis of the optimal length of either massed or distributed work sessions would be required before any practical recommendation about the relative effects of massing or distributing work sessions would be in order.

Conclusions

No firm conclusions regarding the relative influence of massed vs. distributed work sessions appear warranted at this time nor are any consistent statements of support for Mednick's Theory suggested. Further research on sex differences, sex-experimenter interaction, and the associative hierarchy conception of individual differences in problem solving seem necessary. Controlled laboratory analysis would appear to be the proper course for such continued research.
BIBLIOGRAPHY
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INSTRUCTIONS

In this experiment you will be given a number of names of objects like a light bulb or the floor -- and it will be your job to write down as many different ways as you can think of that each object could be used. Any object can be used in a lot of different ways. For example, think about a piece of string. String may be used to attach a fish hook, to jump rope, to sew with, to hang clothes on, and to pull shades. Of course, there are many other uses. Your job is to think up as many different uses as you possibly can for each object. You may be as original as you like, but be sure that each response is useful as well.

You may work on these in any order. Please write one use per line; if you need more room, write on the back.

Do you have any questions?
AN AUTOMOBILE TIRE (used on the wheel of an automobile)
A KEY (used to open a lock)
A SAFETY PIN (used for fastening)
A WATCH (used for telling time)
A BUTTON (used to fasten things)
EYEGGLASSES (used to improve vision)
AUTOMOBILE TIRE (COMMON)

Agreement With Maltzman et al. (1960)

float
roll
swing
bumper
toy
smoke
chair
flower bed (planter)
weight
decoration
target
advertisement
to cut up

inner tube
melt and reshape
slingshots
start fire (burn)
blockade
football practices
insulation
sled
drum head
supporting another object
sell for living (retail product)
make sandals
sand box

Common For Present Sample

any use of a tire (spare, wheel)
hula hoop
bracelet for elephant
flat tire
lay something on it
block off areas
bounce things off of
nest or house for animals
storage bin
paint it
door stop
put under furniture
protection (flowers etc.)
diving through
mash or squash
frisba
marker
a gear
under rug to keep it from slipping
wear around waist
conveyor belt
to hold air
make marks in mud, snow
trade
improve aim

art work
agility-test
roll down inside
stack up (hide inside)
carry things in inner tube
to bounce on (trampoline)
puncture
padding
carry it
smuggle
borders
hold door ajar
noise
mobile
table
necklace for fat person or elephant
replaced (parts too)
prop in movie or stage
cushion or pillow
keep lightning away during storm
to block someone's view
elephant jewelry
car races (obstacles outlining track)
to pollute
AUTOMOBILE TIRE (UNIQUE)

Both Judges

make a barrel
wine press
roll to trip someone
marker
take to junk yard
arms of chair
to measure with
gift
as a levee (stacked)
to get stolen
sound proofing
put in pool to prevent it from cracking in winter
test acid
expansion in towing chain (spring device)

Judge #1 Only

moving heavy objects
wind barbed wire around
half buried & painted for sidewalk trim
collect rainwater
elevator for a tree house
push down street to make people think you have a car
repair a fence
to make owners of Goodyear rich
belt for fat person
bottom of small boat
box springs to collect different types as hobby line wharves
make tuner
lasso
fan belt
test if ground is level
stage prop
donut (giant)
build a ski jump
old tires are relics
adhesive (melted)
novel picture frame

thresher
fill a hole or dam
use a tire gauge on
take out cord for kite string
Christmas wreath
watch band
as a gravestone
prize on a TV show
entrance to a dog house
hoopskirt
use inner tube or valve in another tire
flush out ground hogs by burning roofing (shingles)

 Judge #2 Only

giant pillow
animals to chew on
item in a test
putting around animals head to guide miniature golf game
put around waist so only eat until that fat
to cuss at
a trap
to make skid marks
big ones to make your car look "hot"
counter balance on a pulley
to pollute rivers
use in a balance trick
ships wheel on imaginary ship
demonstrate flexibility
illustrate circumference as a gear in a ferris wheel
spin for #’s game
wear tires to break the wind
used as a base - baseball
use as a floor surface
to wear around waist
to harm animal by rolling down hill inside of it
AUTOMOBILE TIRE (UNIQUE) (cont.)

**Judge #1 Only (cont.)**

- to make a whistle from inner tube air spout shelf nold step block cast (for broken leg) build fire in middle to contain it production to keep lightning away part of harness fuel

**Judge #2 Only**

- flying suucer gyro scope rubberbands handle foot bridge lid blow up for breathing practice cut 1/2 and make a small fence keep people employed cut into belts restraint (straight jacket)

- test roads and paint sand castle keep plants from spreading prop up a window protect flower or shrubs blade covers place mats test unsafe rifles basketball hoop as safety device hold pressure under a jack indicate size of hole to dig for shrub
KEY (COMMON)

Agreement With Maltzman et al. (1960)

lever (pry things open)
clean fingernail, crack, etc.
scratch
noise
start car
key to city
scratch in wood, furniture, paint, etc.
put on key ring or chain
bookmark
wedge
jewelry
gift
paper weight

Common For Present Sample

lock or unlock anything
put under rug
make electrical contact
knife
fishing line sinker
to hide under mat or in mailbox
grading test
scratch glass
hang on string
to wind anything
as a saw
test electricity in lightning
prop open a door
reward or punishment
break a window

decoration
toy
screwdriver
pry open jar, can, door, shoe
polish, etc.
weapon
necklace
make new keys
hobby
dig hole
to throw
poke hole
clue

art work or project
cut, rip material, paper
dig out dirt, wax from crevice
pull shades down
carve
keep in pocket or purse
open bottle tops
something to play with when nervous
flip and catch
in game
prop up a corner of something (table, etc.)
in tricks
in part of a phrase (e.g., "key to my heart")

KEY (UNIQUE)

Both Judges

work a knot loose
nail file
as a button
plug a leak
linear measuring device
link between two strings
KEY (UNIQUE) (cont.)

Both Judges (cont.)

identification around neck of animal
fork
tongue depressor
sled runner
a yo yo (wrap string around)
on test to interpret creativity dart
a bribe
beginning of a new experience
ask your old man for worry where you put it last
drop to see how deep a hole is block view through keyhole
belthook
thumbtack
conversation piece

Judge #1 Only

model clay
mobile
disturb people by dropping to gorge someone
as a spare key
as a pin
branding iron
fuse
use notches for sight on gun
to alter sound of piano by laying several on strings
chain link
letter opener
playing piece in game
evidence in court case
save up, put in jar
test reflexes by running on foot put on string with gum to get something
hammer
hang on a key rod
use in tricks

stage prop
nail
bolt
arrow head
use in crime lab for finger prints
to let air out of tires
give to someone
hairpin
a threat
2.2 lbs. of grass
analyze in chem lab
shoe horn
seal in sealing wax
to work automatic gate or garage door
play a musical instrument
to steal
stir liquid
bend into finger ring
to keep door of a cage shut
to keep from getting things stolen out of your house
pointer
chisel
one that doesn't fit a lock to intrigue a burglar
use in treasure hunt
use in mystery story
handle
reflect light
flip (as a coin)
momento of a special treasure
to use on tests of gravity
to identify a certain room
to loose in one's purse
thrown into H_2O and watch rings
use as punishment (take away)
send it to a friend as a practical joke
### Judge #1 Only (cont.)

- Use to electrocute oneself
- To untangle a mess of tangles in hair
- Swing to tease a pet
- Gapping spark plugs
- Wind chimes on string
- Remove ice from windshield
- Geology scratch test
- Slide in "paper" football
- Pick nose
- Something to hang on belt to look important
- Toothpick
- Bend metal with musical chime
- Inside can for makeshift bell
- Brass knuckles
- Hand on clock
- Battering ram for toy army set
- Hold for hand grasp exercise
- Weight for baby toe exercise
- Instrument to peel an orange
- An experiment (with light)

### Judge #2 Only

- Code to problem
- Ream something out
- Plumb bob on string
- Break balloon
- Crease paper
- Fill a tooth (melted)
- Make impression in something
- Hook to hold down window blind
- Sign of responsibility
- Sew in curtains so they'll hang straight
- Cannon shot
- Show your trust in someone
- Close a circuit
- Show electroplating
- Golf spikes
- Cut yourself with
- Hide in mailbox
- Spinner for game
- A spacer
- Lock it in the car
SAFETY PIN (COMMON)

Agreement With Maltzman et al. (1960)

- punch hole
- decoration
- remove splinter
- toothpick
- puncture blister
- hold diaper
- open glue tube
- hold other pins
- picture hanger
- "pick", poke at something
- clean small ledges (corners, etc.)
- kill insect (bug)
- make wire (scrap)
- pick things apart
- open lock
- weapon
- toy
- make chains
- break balloons
- weights
- pry things open
- sewing
- jewelry
- use as thumb tack
- key ring
- engraving (carving)
- screwdriver

Common For Present Sample

- fishing hooks
- pin clothes, (rips, zippers, etc.)
- cut (paper)
- fix broken eye glasses
- prick finger
- scratch on wood, anything
- probe in dissection
- dart
- tweezer
- bookmark
- keep things pinned down
- hang clothes
- get into small area
- short circuit
- paper clip
- make friend bleed so you can be blood brothers
- pin something on (flower)
- pin pair of mittens or socks together
- pin collections of things together (buttons, washers, etc.)
- unravel stitches in sewing
- earrings - pierce ears
- thread string or elastic
- replace button
- hold material together
- art work
- to write with (dip in ink)
- nail
- pliers
- pointer
- test magnet
- dig with
- belt
- write with
- marker
- hypnotize
- hook
- hold stitches of knitting
- hang Christmas tree ornament
- as shoe laces
- to draw pictures
- connect two ends together
SAFETY PIN (UNIQUE)

Both Judges

a handle or holder
induce abortion
belt buckle
arrow
ring
conversation piece
clock hand
valve
hold ski binding in place
hold down wiggling lab specimens
sculptor's tool
fix back of radio
hold guitar string in place
collect, save, count
help attach false eyelashes
scare
put through nose like a bone
laces on sandals
tie clasp
make a stand for pine cones
radio antenna
to sell
lace up broken shoe string
cuff link
tap TV lead-in wire
not to find when you need it
investigate metal strengths
make container from a flat piece of material
test for numbness
make braille writing
as object in game to remember things

Judge #1 Only

untwist and twist to different shapes
used to unfasten after fastening fuse
straight edge for underlining
pin your parents to bed
switch
catapult
bow
sledrunner
use to stop up a straw
jam keyhole
heat to burn plastic
football in table football
teach someone to count
test a cake (when it's done)
throw in the air and watch it sparkle in the sun
put in mouth
use symbolically on voo doo doll
cause rust stain
soak in coke to demonstrate effect on stomach
marshmallow stick
drain sap from maple tree
to buy
to obtain someone's attention
jam a door
repair small mechanism
hold carburetor linkage
use to differentiate sides of things
teach thumb movement in opening
as a garter
punch holes in IBM card
jam gears in watch
hold down butterfly wing (in collection)
hair clip

avoid embarrassment (rips, etc.)
used as a spring
cut up as tiny nails
record needle
game marker
SAFETY PIN (UNIQUE) (cont.)

Judge #1 Only (cont.)

store beads on
hold a religious medal on clothing
catch on back of homemade jewelry
tie to string and retrieve some-
thing small
connect rope
holding washers together
hold collection of pierce earrings
curtains
bend for Christmas ornament attach-
ments
ribbon holder
point of a compass when one isn't
available
receipt holder
glue to back of a broken pin clasp
needle
straighten out and clean waterpipe
make waist in small outfit
letter opener
save and give out to any one who
needs
pick infection
electrocute oneself
test reflexes or sensitivity
separate eyelashes
stuck in ceiling -hang things from it
puncture pimples
attach to pencil to hang for writing
notes
melt down
untangle something
makeshift string
joke
to organize buttons
tied to string and thrown
hinge on cardboard box
untangle necklace chain
hold clothes line together
force putty into a small hole
use as a tag when swimming
instead of shoe laces
mark line on something
wire
use on hunting license
work knot loose

Judge #2 Only

break bubbles
pin a bed roll together
hold broken sandal
keep shirt tucked into pants
poke holes in canvas for outdoor
shower
fix a bench cover
jumper in broken electric wire
poker chips
keep balloon from taking off
to draw a circle (hole at bottom)
punch hole to make spectroscope
begin sealed paint tube
scratch back
hold center for string compass

keep worn out shoes together
pin strap to broken shoe
pliers
pin socks to pants
hold braided hair
unravel stitches
hold collar down
hold sandwich together as a toothpick
play money
compare weight with object
test magnet
put hole in foil to cast image of
sun on paper
break threads
hold "joint" to smoke longer
SAFETY PIN (UNIQUE) (cont.)

Judge #2 Only (cont.)

- Fasten number to back of uniform
- Hold something over fire
- Keep it closed
- Hang loose on a hanger
- Hypnotize
- Push thread through button
- H'ors d'ourves sticks
- Pin up Christmas stocking
- Separate clothes for washing
- Flip paper wads

- On certain tests punch holes for answers
- Hold down balsa wood airplane
- Pin something to belt loop
- Test hardness (Geology)
- Hold pajama top and bottom together as a charm on bracelet
- Example of what attached fan belt looks like
- Make vest
WATCH (COMMON)

Agreement With Maltzman et al. (1960)

decoration
paper weight
tell direction
timing events
jewelry
art pieces
time pulse
time tests
teach to count (numbers)
metronome

Common For Present Sample

luminous dial to see in dark
reminder of events
to wear special ones of famous persons
crystal as window
to fall asleep with noise
reflector
status
as a ring
pendulum
conversation piece
to break
to see when something is over or someone leaves
use parts for something else
a pocket watch
demonstrate gears
show human technology or creativity

WATCH (UNIQUE)

Both Judges

use band as a holder (napkin ring or put poster inside)
whip someone
to torment people who hate watches

use crystal as a monocle
to barter or trade
WATCH (UNIQUE) (cont.)

Both Judges (cont.)

take out spring and use as a motor
symbol of rat race
object of scorn or satire
hide small object inside (secret compartment)
crystal as porthole
radium as isotope
demonstrate "planned obsolescence"
use stem as an axle
book marker
winch
use metal face as razor
motive for petty thief
use band to imprint clay
large watch to make a table (add legs)
collect dust
to fill your pocket
draw faces on
frisbee
top
pulleys
gyroscope
pill box
fishing reel
plant microphone
dig with edges
band as belt on doll
hold down wrist of sweater
take out and use jewels
object in game to remember things
pile of junk after a fight
use glass as peep hole in door
calculate earth gravity
as blackjack
illustrate what Switzerland is known for
make I.D. from band
chain
use band as constriction bandage to stop bleeding
take numbers off to label things
as collateral to buy on credit
tie to bottom of shoe to see if it still runs after jumping off a roof or walking on it
poor type of sundial when not running
make up stories about
wheel
mousetrap
spool
nails
vise
production
hammer
advertising display in store window
to punch in and out time at work
attract a crow you've been trying to catch
ticking noise amplified to drive someone insane
antique sold for money
self-defense
to test humity on glass
learn self discipline in remembering
to wind it
to look at if there's nothing to do

Judge #1 Only

glowing one to keep a child from becoming afraid
symbol of Salvador Dali
make an ass out of Agnew
use spare parts
wear as a reminder
to test acidity in body by a dis-coloration of skin
**WATCH (UNIQUE) (cont.)**

**Judge #1 Only (cont.)**

to turn off remote control  
use spring as a cutting blade  
set another watch  
keep picture in  
motor to run something  
measure longitude  
melt down metal  
twist band when bored  
gears to turn stuff  
hold something else in place  
master of rushed society  
attach to leg to hold up socks  
use band as a loop  
use band as a cinch  
as a direction marker  
bracelet  
glass from big watch as table top  
attach to watch band  
sea how close thunder is  
attach to string and throw it  
twist band to relieve tension  
toy car  
know how much get paid for  
excuse for being late  
starting fire (crystal)  
keep arm from looking bare  
set up watch i.e. spy  
provide a purpose for a watch band  
mechanisms can be used in inventions  
demonstrate gear ratios  
name for guard duty  
use elastic bracelet as demonstration  
of harmonic motion of a spring  
run someone's life  
demonstrate delicacy of tiny mechanisms  
to break while playing sports  
for engraving loving sentiments  
watch second hand go around during  
boring lecture  
hang from wall to be used as a clock  
scare mailman by ticking  
put in center of sculpture  
brake and give to mailman  
wind it  
as incentive  
example of human technology  
container  
spring  
have something on wrist  
man to show cleaverness  
melt and make spear  
express mood (Mickey Mouse, Agnew)  
pocket watch used by old people

**Judge #2 Only**

tell water depth  
use writing in ransom note  
for something to hang at the end of a chain  
draw from  
measure wrist size  
to see bottom of ocean through  
use hands as safety pin
BUTTON (COMMON)

Agreement With Maltzman et al. (1960)

decoration
draw circle
teach how to count
make rattles
make eyes on dolls, animals, snowmen, etc.
small target
make jewelry
toy
poker chips
bingo
noses for dolls, etc.
learn colors from slug
make noise (with many)
hold something together

Common For Present Sample

tiddly winks
hold things fastened
button anything as shoes, coat, instead of zipper
placeholder or marker
fill a bean bag
start a motor
to chew on
replace safety pins
knob
wheels for little car
slingshot
barter or trade
jam slots
as money
under leg to balance a table or chair
fasten clothing
art project
wheel
weight
play with
switches (buttons to turn on and off)
campaigning purposes
bookmarker
keep on clothing
handle
object to dive after
spacers
to toss as coin
marker in games
pry something open
to patch or plug a hole

BUTTON (UNIQUE)

Both Judges

ear plugs
sew together flat to make material
hair clip or barrett
store microfilms in
on floor to make people slip
legs on stand of flat ashtray
object in game to remember things
small scales platform
make pencil holder
handle
reinforcer in psychology
Chinese torture trick instead of water
earring
keep cover on flask
fingers cymbals
BUTTON (UNIQUE) (cont.)

Both Judges (cont.)

- sugar cubes for children playing house
- illustrate what a red blood cell looks like
- make a toy caterpillar
- measure depth of a hole
- dip in ink to make design on paper
- float or lure on fishing line
- wind string on gift
- restrict flow of liquid through holes
- plate (for tiny man)
- use holes for message decoding skin on water
- use to lock cupboard doors
- drop out of tall building
- tap on shoe
- melt

Demonstrate surface tension
- hatch on toy sub
- buckshot
- in slot of chain lock
- small paint roller
- in lieu of dirt to support a small Christmas tree
- put on a string and spin it
- as a whistle
- hook around wrist of a baby
- as a sinker
- fill empty jars
- signal for help in hospital bed
- as a whistle
- make sewers job easier
- hook around wrist of a baby
- old peoples home (sew on buttons)
- keep in sewing box
- give shoes a certain look
- place on bottom of fish tank
- save as souvenirs
- pry something open
- also used as in "button your mouth"
- level a chart that is uneven
- pictures of people
- fill empty jars
- opening and closing automatic windows
- used on household appliances
- insulator
- used for sales
- add color to clothes
- keep things tight around your neck
- unfasten after fastening
- build a "tower" of buttons
- mistaken as candy and swallowed
- collect antique
BUTTON (UNIQUE) (cont.)

**Judge #1 Only** (cont.)

- save and trade for prettier buttons/hang buttons from different lengths
- attached to rubber band and bent
- safety clip and put inside an envelope and twisted to scare people
- musical instrument
- use in tricks
- put on string on end of light bulb string
- screw driver
- belly button
- "button your lip"
- tied to something to prevent it from slipping in a hole
- charm for bracelet
- pattern on jeans
to push
- print snappy lines to gross out people
- table hockey
- hit with rubber band and turn it once

**Judge #2 Only**

- swallow to kill yourself
- pitch and catch
- instrument in pottery
- choke a cat
- pitch pennies
- paperweight
- backing for larger button
dive in pool for mnemonic device
- roll down sidewalk
- make a potholder
- string them for in doorway
- string for Christmas decoration
- in paper bag for a noise maker
EYEGLASSES (COMMON)

Agreement With Haltzman et al. (1960)

change appearance (looks)
magnify
disguise
keep out of fights
for reading (studying, etc.)
relieve headaches
chew on ends

Common For Present Sample

reflect light
use ear piece to stir
petri dish in chemistry
wear to be "in"
change, improve vision
scratch
item in "memory test"
replace contacts
look of scorn
put on display mannequin
use wire
test eyes with
something to clean

protect eyes (from glares, sparks, etc.)
cutting
look intelligent
start fires
paperweight

sunglasses
hair band
part of a costume
microscope slide
look more handsome, distinguished
write in loose sand
symbol studious
use hinges in earpieces
hold a hearing aid on
use as hook
use to irritate someone
pry
merchandise (to sell)

EYEGLASSES (UNIQUE)

Both Judges

freak yourself out by the various connective strengths
use monocle in antique display
in front of camera lens to give a new bend to an old picture
detect moisture
retain fingerprints
remove them for relief
give weird effect on wall with projector
put on pet and take his picture
make triangle to keep bugs inside
windshield on toy car
gain a different perspective of the world
hold up something light
hold a book open
to how ones forgetfulness (when forgetting where they are)
put on dolls and snowmen
wire frames conduct electricity
use old lenses in new glasses
breaking glass—sound effects in movie
EYEGLASSES (UNIQUE) (cont.)

Both Judges (cont.)

use arms as tongs
test deodorant stickiness
help people get jobs
create prejudice and illustrate
the stupidity of being biased
throw into stream and watch as
they float away
clutter up desk
to be embarrassed to have someone
see you wear them
spread glue with earpieces
rest them on your ears and nose
a placebo for a hypochondriac
draw on
levers
picture frames
oil lamp
screwdriver
level powders in a line
a prism

Judge #1 Only

hide dilated pupils
used to carry a couple of drops of
water
anchor for a toy boat
used in test to see how ones eyes
adjust
bridge for ants
lens for clock crystal
electricity insulator
use screws for other things
show use of plastics, glass
hide mole between eyes
to keep hands occupied
old screws in new pair of glasses
twist in hand when nervous
to keep bangs out of eyes
twirl when bored
provide opticians with jobs
pinch someone where frame comes
together

push something without touching it
hold pencils behind your ear
preoccupy yourself by cleaning them
hold loose leaf papers together
use glass as top for a pin
leveler under dressers
light cigarettes
to be self conscious of
use earpieces as hooks
use lenses as ashtray
sit on by mistake
keep them clean
example of human technology
prop open drawers
slingshot
candle holder
drumstick
to press butterflies
block a hole

card game - read opponents cards
(reflection)
weight on a rope
put on a manikin
weight for mobiles
sell
hide dope or message in
holding too short of line together
that may break
straight edge
give headaches
pick things apart
build a telescope or microscope
binoculars
use lenses as outline for drawing
circles
illustrate physical optics
illustrate attractive features
if plastic melt them to stick two
things together
EYEGLASSES (UNIQUE) (cont.)

Judge #1 Only (cont.)

- keep optometrist in business
- corner of glasses as tweezers
- place on statue
- fill an eye glass case
- to make an animal look intellectual
- to sell
- screws to fix broken watch
- hide eyes from others
- twirl in your hand
- razor blades
- tiny saucers
- used to wear on a chain around your shoulders
- hang from ceiling as decoration
- display in glasses store
- helps one to sleep and not be as conspicuous as someone without them
- reach into small opening

Judge #2 Only

- use bifocal line to check straight lines
- help one think better (psychological)
- without lenses let children play with them
- wire frames hold something together
- take off and replace as emphasis windows
- frisbe
- use ear piece as necklace
- grind up glass and poison someone
- 3-D art work
- to pay a lot of money for
- to steal
- to buy
- use when not wearing contacts
- to impair vision
- annoyance when slip down nose
- pry open an object
- pencil holder
- hinges used for small box
- make money
- model for drawing class
- catch onto object when one can't reach
- lets younger person wear eye make-up and cover it up
- clean out clogged pipe
- piece of merchandise
- bend metal arm for necklace
- correct bump on nose
- enables one to have a pretty eye-glass case
- to lose
- to be glad you don't have to wear them
- object of scorn
- to leave with someone so you can see them again