THE RELATION OF CREATIVITY IN COLLEGE STUDENTS TO ATTENTION CUES

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THE RELATION OF CREATIVITY

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ATTENTION CUES

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CHAPTER I

THE PROBLEM

Background of the Problem

Until recently, research in the area of creativity has focused mainly on individual differences in creative ability. Subjects in these studies have typically been chosen on (a) the basis of judges' ratings of their behavioral characteristics (e.g., Ghiselin, 1952; Sprecher, 1959; Gough, 1961a), (b) their *"creative"* work (e.g., Drevdahl, 1956; Cattell, 1959; Taylor, Smith, Ghiselin and Ellison, 1961),or (c) results of psychometric tests designed to measure creative performance (e.g., Guilford, 1950; Guilford, 1957; Schaffer and Bell, 1958; Holland, 1959). Using these criteria, a variety of intellectual and personality factors have been related to creative performance (Holland, 1959; Yamamoto, 1960; MacKinnon, 1961), and have resulted in a description of characteristics common to creative persons. It has not, however, led to any explicit theory concerning the creative process, i.e., what actually takes place during creative thinking.

More recently, attention has been focused on the nature of the creative process itself, and on the development of explanatory models. Mednick's model (1962) emphasizes variation in cognitive response processes as a prerequisite for creative thinking. For example, he contends that highly creative persons tend to produce more responses to

any given stimulus than persons of lower creativity. A question arising from this contention involves the nature of the factors contributing to such variation. One possibility is that the perceptual process of individuals varying in creativity may differ in the manner in which information (environmental cues) is received and/or coded. The results of two recent investigations (Mendelsohn and Griswold, 1964; Mendelsohn and Griswold,1966) seem to indicate that increased sensitivity to environmental cues and greater ability to utilize such cues in problem solving are characteristic of highly creative college subjects. Mendelsohn and Griswold (1966),utilizing both verbal (Remote Associations Test) and nonverbal (Barron-Welsh Art Scale) measures of creativity, propose that one of the processes underlying this capacity may be the "wider deployment of attention" by high creatives (p. 430). These conclusions are limited,since both the successful predictor or creativity (Remote Associations Test) and the environmental cues employed were verbal. The fact that the nonverbal measure of creativity (Barron-Welsh Art Scale) was not a successful predictor led the authors to state that "perhaps theoretical approaches to creativity have erred in the direction of considering creativity a unitary phenomenon, a trait or capacity relatively independent of the medium in which it becomes manifest" (p. 431). They further contend that performance level on the nonverbal measures may be expected "to be related to the acquisition and use of nonverbal, specifically visual incidental information" (p. 431).

Since research in this area is still in the initial stages, more knowledge needs to be gained about the process of creativity in order to increase the scope and accuracy of empirical generalizations.

Statement of the Problem

If indeed creativity is a non-unitary phenomenon and if it is related to attention (as hypothesized by Mendelsohn and Griswold), then it might be expected that a *verbal* measure of creativity would predict successful performance on a *verbal* attention task and that a *nonverbal* measure of creativity would predict successful performance on a *nonverbal* attention task. Furthermore, a *verbal* measure of creativity might not necessarily predict performance on a *nonverbal* attention task, nor might a *nonverbal* measure of creativity predict performance on a *verbal* attention task.

If, however, creativity is a general unitary concept, then *verbal* and *nonverbal* tests of creativity should enable successful prediction of attention in both *nonverbal* and *verbal* situations. The present research attempts to answer these questions (see Figure 1).

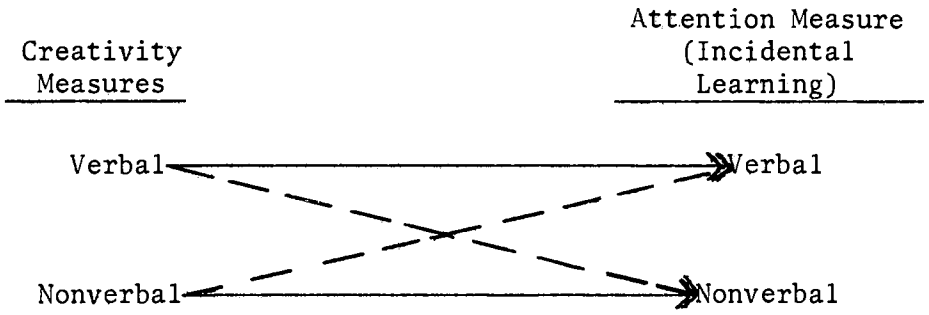

Figure 1: Proposed Research

CHAPTER II

REVIEW OF THE LITERATURE

This review is divided into three general sections: (1) Theoretical Formulations and Empirical Data Relevant to Creativity; (2) Incidental Learning Variables; and (3) Verbal and Nonverbal Creativity Measures. All three sections will emphasize those studies that relate to the present investigation.

Theoretical Formulations and Empirical Data Relevant to Creativity

A review of the literature on creativity by Mackler and Shontz (1965) concludes:

> "the major criticism of all theories is that each view gives only a piecemeal explanation of creativity....Trait and Associationistic theories appear narrow in scope; Gestalt and Interpersonal are broad. However, no theory, narrow or broad, adequately describes the process of creativity" (p. 236).

The difficulties cited by Mackler and Shontz are due to the fact that researchers in creativity have differed in their definitions of creativity, in the underlying assumptions from which they have generalized, and in their research strategies. These differences make classification of the various theoretical approaches difficult. Most of them, however, may be categorized according to one of two dimensions: the holistic-elementaristic dimension or the descriptive-process dimension.

Some of the holistic theorists have gone so far as to say that creative acts should not be analyzed, because doing so would destroy the very essence of the "process of creation" (Maslow, 1961; Rogers, 1961; Mooney, 1963).

To these theorists, creativity is a direct experience which defies any objective analyses based upon causal laws. Other approaches within this framework "aim to differentiate, yet to retain the whole" (Allport, 1957, p. 9). Probably the majority of the holists would agree that studies of creativity would profit from systematic observation and analysis of the creativity situation (Blatt & Stein, 1959; MacKinnon, 1962; and Sanford, 1965). These holistic theorists have generally emphasized what may be termed the heightened awareness or *"attention"* that characterize the highly creative individual. For instance, Schachtel (1959) describes the creative individual as possessing "openness in the encounter with the world, meaning that one's senses are more freely receptive to reflections of the environment" (p. 243). Rogers (1959) states that the creative person remains "open to experience in the grasping of ever-new things and persons in an always changing world" (p. 70). Similarly, Anderson (1959) believes that creativity requires "sharp perceptions and subtle sensitivities in one's relating to the environment" (p. 128). These conceptions are similar to the ones being investigated in the present study.

Approaches based on elementaristic (reductionistic)orientations are at the opposite end of the continuum. These approaches would include the association and trait theories of creativity. Studies in this area center upon either classification of traits relevant to creative individuals (Guilford, 1960; Guilford, 1963; Guilford, 1964), or

experimental studies with emphasis upon variance among certain treatment groups (Maltzman, 1960; Mednick, 1962; Stats & Stats, 1963). Similar to the holistic theorists, the elementaristic approaches devote attention to the perceptual and nonverbal qualities that characterize creative individuals. As far back as Ribot (1900), there is the belief that low creative persons display signs of withdrawal of attention. Guilford (1950), in his earliest writings on creativity, stated that there might well be a "perceptual quality that gives a general impressionability to the environment" (p. 452). He further outlined the possibility of fluency factors, nonverbal and verbal which are yet undiscovered, and the need for researchers to address themselves to "identifying the non-intellectual factors in the domain of visual-perceptual abilities" (Guilford, 1950, p. 449). He concludes that tests of perceptual ability should be developed and suggests that these may take the form of "presenting pictures of forms that are conventional and regular except for minor irregularities" with the creative person being able to detect unusual features (Guilford, 1957, p. 581).

A study of the other dimensional category, descriptive-process, indicates that much of the research on creativity has focused on examination of characteristics common to creative persons or on the processes involved. Of the two, descriptive studies are the mody prevalent in the literature. The pacemakers in the descriptive area are Torrance (1959; 1962), Getzels and Jackson (1962), and Guilford (1950; 1956; 1957; 1959). Torrance has focused on identifying creative persons in terms of what they are like and how they behave. For example, he reports that *"highly talkative"* children tend to earn higher scores on verbal tests of creativity, but not on nonverbal measures (Torrance,

1959). Similarly, Torrance (1959) found highly creative grade-schoolers performed better on tasks requiring language and reading skills than highly intelligent grade-schoolers. This finding was reversed with tasks requiring arithemetical skills. Like Torrance, Getzels and Jackson have studied creativity by focusing on person-social differences in subjects of varying creative ability. These researchers were the first to postulate differences between intellectual and creative functioning, stating that the relationship between I.Q. and creativity is little more than can be expected by chance (Getzels & Jackson, 1962). They further report that "although a certain amount of intelligence is needed for creative performance, intelligence and creativity are by no means synonymous" (Getzels & Jackson, 1962, p. 125). Guilford (1959) differs somewhat in his approach from both Torrance and Getzels and Jackson in that he employs the factor-analytic method to discover those traits that distinguish one individual from another. In this respect, Guilford may be described as taking both an elementaristic and descriptive approach to creativity. Guilford (1959) believes that once the underlying traits (factors) have been discovered as describing creativity, the basis for selecting individuals with creative potential is attained. Those traits currently related to creativity are described as: "ability to see problems, fluency of thinking (word and ideational), flexibility of thinking and originality" (Guilford, 1959, p. 146). In this regard, the following interesting correlations were reported by Guilford (1956): .25 between grades in an astronomy course and performance on a test of expressional fluency; .37 between scores on a test of ideational fluency and a criterion of engineer performance based on pay increases; and .31 between a measure of adaptive flexibility and the pay increase criterion.

Others taking a descriptive approach to creativity have sought to isolate personality characteristics of creative individuals (Stein, 1956; Barron, 1958; Helson, 1961; MacKinnon, 1961). Barron (1958) reported that high schorers on the Barron-Welsh Art Scale tend to be more dissatisfied, pessimistic, irritable, and unstable than low scorers. And MacKinnon (1961) stated that highly creative architects demonstrate greater independence, determination, and industry, and are more self-accepting than their less creative colleagues. Recently, a few of the *"Descriptive"* therorists have moved toward the process end of the continuum in proposing that creative individuals possess increased awareness and sensitivity to the environmental surroundings. For example, Torrance (1962) defined creative thinking "as the process of sensing gaps or disturbing, missing elements" (p. 16). A co-worker, Yamamoto (1962), stated a somewhat similar but more explicit position: "One must be sensitive to the internal and external environment to recognize problems.....and to pick out the relevant cues" (p. 1).

The process approach to creativity has been given the least amount of attention by researchers. Crutchfield (1961) first stated the need for research to focus on the creative process. He noted that cues from the environment, perhaps unaware to the individual may develop while one engages in other activities. Experimental findings (Crutchfield, 1961) suggested that a subject's performance on a former task may facilitate insight on a later task even though he reports no awareness of the relevant cue present in the preceding task. Crutchfield (1961) added that high creative persons tend to be "perceptually open and prefer complexity" (p. 558). Similarly, Barron (1953a) equated performance on a nonverbal creativity measure (Barron-Welsh Art Scale) with a bipolar

factor of preference for perceiving and dealing with complexity as opposed to preference for simplicity. Barron (1953b) also reported that high creatives (defined by Barron-Welsh scores) have a higher tolerance for ambiguity in that they were less likely to yield to the incorrect group consensus in the Asch line judgment situation than low creatives.

Campbell (1960) and Mednick (1962) have proposed models which allow for deductions concerning individual differences in creative ability. Campbell (1960) based his theory of the creative process on the assumption that creativity is no different from any other cognitive process and emphasizes variation in cognitive responses as a prerequisite for creative thinking. He has proposed a trial and error process based on what he terms a "blind-variation-and-selective-retention model (which predicts individual differences) along all parameters of the process" (p. 391). Furthermore, the model proposed that "a mechanism for introducing variation, a consistent selection process, and a mechanism for preserving and reproducing the selected variations" are necessary before the creative process can take place" (p. 381). Mednick (1962) has presented an associative interpretation of the process of creative thinking based on many traditional views starting with Ribot (1900; see Creativity Measures Section).

Incidental Learning Variables

Melton (1964) presents the following definition of incidental learning: "When the instructions do not prepare the subject for a test on a given type of materials, it is convenient to designate the learning of these materials as incidental" (p. 185). Postman (1964) adds to this definition by stating that intentional and incidental learning can be

operationally distinguished by the use of different classes of orienting instructions. He contends that the effect of instruction on learning varies as a function of the specificity of the verbal communications given to the subjects. These effects may be maximal in the case of subjects who are prepared by the instructions for a test of retention or minimal in the case of subjects who are not so prepared.

Two basic experimental methods have evolved in the study of incidental learning (Kausler & Trapp, 1960). The earliest design is termed *"Type I"* and is characteristic of *"classical"* investigations of incidental learning (e.g., Biel & Force, 1943; Prentice, 1943). In this design, incidental learning subjects are provided with an orienting task but given no instructions to learn the required materials. Intentional learning subjects are given instructions to learn the required materials. After exposure to the material during the orienting task,subjects in the incidental learning condition are given an unexpected test of retention. For a review and criticism of studies employing this design, see McLaughlin (1965). More recently, the *"Type II"* design has come into use. In this design, subjects are exposed to two sets of materials, instructed to learn one of the sets, and later tested for the materials which they were not instructed to learn (Mechanic, 1962a). Moreover, the irrelevant material is directly related to the material to be learned under intentional conditions. For example,in a study by Bahrick (1954), subjects learned a list of geometric forms which were of different colors. The colors were a feature of the learning material which was irrelevant, but directly related to the task toward which the subject was oriented by the instructions.

A review of the literature indicates that there are four major

experimental variables affecting the amount of incidental learning. These are as follows: (1) number of presentations of materials, (2) presentation interval, (3) amount of material presented, and (4) the measure of retention employed.

Mechanic (1962b) stated that, in general, increasing the number of presentations of a given set of materials results in increases in both incidental and intentional learning. Similarly, increases in presentation interval also significantly facilitate both incidental and intentional learning. The standard interval appears to be between 3 and 5 seconds (Kausler & Trapp, 1961; Fisher & Cook, 1962); thus, 5 seconds was the interval decided upon in this study.

Postman and Adams (1958) found that increasing amounts of material results in decreasing incidental and intentional learning for high meaningful nonsense syllables, although this effect is less for incidental learning when low meaningful nonsense syllables are employed. The amount of material presented in most incidental learning studies varies according to the number of dimensions the subject must learn. It has been reported that seven items produces adequate incidental learning when subjects are required to learn one of two dimensions associated with each item (Bahrick, 1954).

Finally, investigators have reported that the use of the recognition method to tap retention allows for greater amounts of incidental learning as compared to the free-recall method (Postman, Adams, & Phillips, 1955; Postman & Adams, 1957). The recognition method thus appeared to be the preferable one for the present study.

Although the literature reveals little experimental interest in determining what material might be amenable to incidental learning

(Berlyne, 1960), some findings have been reported and incorporated in the present study. Mechanic (1962b) has reported that stimulus items most frequently learned intentionally were also most frequently learned incidentally, and that the stimulus properties facilitating these two types of learning are the same. However, one dimension which has been found to vary for incidental and intentional learning is the meaningfulness of verbal stimuli (Mandler, 1954; Postman & Phillips, 1961). Postman & Phillips (1961) have found that low meaningful stimuli evoke less effective differential responding (defined as the number of different associations elicited by a stimulus item) from incidental than from intentional subjects. Thus the lower the meaningfulness of the stimuli the greater the differential in amount retained by incidental as compared to intentional learners. Mechanic (1962b) adds further support to this in his finding that the more meaningful the material the greater the incidental learning. It has also been found that the greater the number of "pronouncing responses" required of subjects during the orienting task, the greater the amount of incidental learning (Mechanic, 1962b).

Another variable of relevance to the present study is the similarity of the verbal items. It has been reported that increased similarity of items has a detrimental effect on both intentional and incidental learning, although the decrement is greater for the intentional learners (Feldman & Underwood, 1957; Postman & Adams, 1957). A final stimulus variable of importance for incidental learning is the position of the irrelevant cues. A finding by Kausler & Trapp (1960) indicated that as "the irrelevant cues are moved toward the periphery of the perceptual field, the range of attention for these cues will decrease" (p. 377).

This finding would imply that the *"Type II"* design would best enhance any incidental learning, since in this design the material is directly related to the material to be learned under the intentional conditions.

Frequently, individual differences in incidental learning are larger than comparable differences in intentional learning (e.g., Postman & Phillips, 1954). McLaughlin (1965) reports that this finding is not surprising, since under incidental learning conditions subjects are not motivated to use their discriminative and verbal skills to differentiate and integrate the stimulus items. Consequently, "response habits with which the incidental learner enters the experimental situation are the chief determinants governing the selectivity of incidental learning" (p. 271).

Some of the findings regarding individual differences are relevant to the present study. For instance, Cohen and Nelson (1965) found that sex differences may result from the type of incidental materials employed. In their study, females recalled significantly more incidental material than males when these materials were colored (red and yellow). Similar findings are reported by Cohen (1962). Both Goldstein and Kass (1961) and Mechanic (1962a) failed to find any relationship between intelligence and amount of incidental learning. And in a recent study, Laughlin (1967) concluded that "the underlying process in both creativity and incidental learning was demonstrated to be relatively independent of differences in high level verbal intelligence" (p. 119). Finally, Plenderleith and Postman (1956), employing the *"Type II"* design, found empirical evidence that two characteristics of individual subjects were especially related to success in incidental learning: (a) the ability of the subject to maintain attention to multiple aspects of the stimulus,

(measured by a symbol-discrimination task), and (b) the availability and effectiveness for subjects of differential responses to the stimulus items (measured by the number of anagram solutions). Similarly, Kausler and Trapp (1960) state that "cognizance of irrelevant cues would appear to be dependent upon the range or span of perception operating during performance on the intentional task (relevant cues), and as the range of perception extends beyond the central relevant cues, more peripheral cues are utilized, thus permitting more irrelevant or incidental cue learning" (p. 373). On the basis of these findings, it would seem that an incidental learning task might be an excellent measure of *"attention"* as it is defined in the present study.

Verbal and Nonverbal Creativity Measures

A conception which explains creative performance within an associative framework has been developed by Mednick (1962). This approach emphasizes individual differences in creativity. Mednick (1962) believes that "any ability or tendency which serves to bring otherwise mutually remote ideas into contiguity will facilitate a creative solution" (p. 222). For Mednick, the highly creative individual, in comparison to his low creative counterpart, has a greater number of associative elements at his disposal in a given stiumulus domain. Based on these theoretical considerations, the operational definition of creativity takes the form of a test (the Remote Associates Test -- RAT).

Most validity studies of the RAT have employed two basic types of criteria: (a) the ratings of individuals by superiors or by other expert judges, and (b) the ratings of an individual's products. For instance, in a study by Mednick (1963), graduate student advisors rated individuals

on a research creativity checklist. When these ratings were intercorrelated with the RAT, Miller Analogy Test scores and grade point averages, the only significant correlation obtained was with the RAT (r=.55, P<.05, N=43). Similarly in a second study (Mednick,1962),the RAT was given to 22 suggestions-award winners at various IBM installations. Only one of these subjects had received any education beyond the high school level. The RAT scores were correlated with the number of adopted suggestions (r=.44, P<.05). When a partial correlation which controlled for verbal fluency was computed, the above correlation increased to .53. Finally, a group of 20 architectural students at the University of California were tested with the RAT (Mednick, 1962). Design instructors, who had known these students for one year and were very familiar with their products, were asked to rate their level of creativity. The correlation between the two measures was .70, P<.001. These ratings were also correlated with the student's performance on the Terman Concept Mastery Test. However, the correlation was non-significant (r=.07).

Recently, the RAT has been found to successfully predict creative performance on various independent tasks. For example, Higgins (1966) reports a significant difference between high and low RAT scorers on a number of original anagram solutions (P<.05). Significant differences have also been found between high and low RAT scorers on the number of verbal responses produced when these responses are reinforced by novel word associations (P<.01; Houston & Mednick, 1963). The authors reported that high creative subjects tended to choose nouns since these were followed by a novel association, while low creative subjects tended to choose nonnouns since these were followed by a common association.

Studies focusing on the theoretical constructs upon which the RAT

is based have also been reported. Mednick, Mednick, and Jung (1964) found support for the prediction (Mednick, 1962) that high creative subjects (defined by RAT scores) would respond relatively steadily and produce more associative responses to stimulus words than would low creative subjects ($P<.01$). And, Laughlin (1967) reports that "the ability to form, retain, and utilize remote associations" which is characteristic of high RAT scorers is independent of high level verbal intelligence (p. 115).

Reliability studies on the RAT indicate that it has adequate internal consistency. Split-half coefficients tend to be in the .90's for adult samples (Mednick, 1963) and range from .84 to .96 with children (Mednick, 1962).

The Barron-Welsh Art Scale (BWAS) is drawn from the Welsh Figure Preference Test (1959). It was originally derived by comparing the frequencies of responses of artists with those of the general population in preferences for complex, asymmetrical designs (Barron, 1953a). The scale seems to measure esthetic sensitivity, tolerance for ambiguity, and *"liking"* for complexity, factors often associated with creative performance and potentiality (Eisenman & Coffee, 1964; Taylor & Eisenman, 1964).

The BWAS has in the past consistently separated artists from non-artists. In early studies by Barron and Welsh (1952), the scale was cross-validated on two samples of 30 artists and 30 non-artists. It significantly differentiated both groups within the two samples ($P<.001$). In an independent study, Rosen (1955) found the BWAS not only differentiated between artists and non-artists, but faculty ratings of originality on the productions of 44 art students showed a significant

correlation of .40 with BWAS scores. When ratings were correlated with grade point averages, this correlation fell to .24. More recently, Barron (1961) has reported a study involving doctoral candidates in the science department at the University of California. When the candidates were separated on the basis of faculty ratings into two groups, the more original and the less original, it was found that the more original students scored significantly higher on the BWAS than the less original. In another study, Gough (1961a) found that of 11 assessment techniques employed to identify the more creative members of samples of writers, physicists, industrial research workers, mathematicians, and engineers, the BWAS correlated highest with the criterion ratings (r = .41). Furthermore, the BWAS consistently differentiated between the more and the less creative members of the above samples. Finally, it was found that within a sample of 45 research scientists, the Terman Concept Mastery Test did not relate to creativity. Against the rated criterion of creativeness the correlation was -.07 (Gough 1961b). Barron and Welsh (1952) found split-half reliability of the BWAS to be .96, thus indicating adequate internal consistency.

Summary

After examining the many approaches to the study of creativity, it appears that much of the research has not been guided by explicit theory about the processes which take place during creative thinking. The fact that each approach has its unique assumptions, particular definitions, and preferred techniques of inquiry, makes integration of information about creativity very difficult. It is apparent, however, that all of the approaches reviewed are in agreement on the general hypothesis that

creativity partially involves nonverbal, visual-perceptual abilities in which highly creative individuals are somehow more *"perceptually open,"* possessing heightened attention and greater sensitivity to environmental cues. Yet, only three studies have been reported in the literature (Mendelsohn & Griwsold, 1964; Mendelsohn & Griswold, 1966; Laughlin, 1967) which systematically attempted to test this hypothesis. None of these studies, however, employed nonverbal, visual stimuli as environmental cues nor was an attempt made to account for possible sex differences. With these facts in mind, the purposes of the present study were as follows:

1) To expand upon the findings of Mendelsohn and Griswold (1966), using a somewhat different measure of verbal attention.
2) To investigate the possibility that high creative and low creative individuals (as determined by a *nonverbal* test) differ in terms of a nonverbal, visual measure of attention.
3) To investigate the possibility that high creative and low creative individuals (as determined by a *verbal* test) differ in terms of a nonverbal, visual measure of attention.
4) To investigate the possibility of sex differences among high and low creatives on the nonverbal and verbal measures of attention.

CHAPTER III

METHOD

The method is presented in four sections: (1) Subjects, (2) Apparatus and Materials, (3) Description and Purpose of the Creativity Measures, and (4) Procedure.

Subjects

Mednick's Remote Associations Test (RAT) and the Barron-Welsh Art Scale (BWAS) were administered to 240 introductory psychology students at Oklahoma State University. Approximately equal numbers of male and female subjects were included. From this initial pool, a verbal and a nonverbal sample of 48 each were drawn. The verbal sample consisted of 12 high creative males and 12 high creative females (score of 18 or above on the RAT) and 12 low creative males and 12 low creative females (score of 12 or below on the RAT).

The nonverbal sample consisted of 12 high creative males and 12 high creative females (score of 32 or above on the BWAS) and 12 low creative males and 12 low creative females (score of 17 or below on the BWAS). No subjects were chosen who obtained equally high or low scores on both measures.

Subjects in both the verbal and nonverbal creativity groups (high and low) were further sub-divided according to the type of incidental learning task to which they were assigned. (See Tables Ia and Ib).

TABLE Ia*

RAT SUB-GROUPS

(Sub-group N=6)

High Creatives				Low Creatives			
Verbal Incidental Learning		Nonverbal Incidental Learning		Verbal Incidental Learning		Nonverbal Incidental Learning	
Central	Peripheral	Shape	Location	Central	Peripheral	Shape	Location

TABLE Ib*

BWAS SUB-GROUPS

(Sub-group N=6)

High Creatives				Low Creatives			
Verbal Incidental Learning		Nonverbal Incidental Learning		Verbal Incidental Learning		Nonverbal Incidental Learning	
Central	Peripheral	Shape	Location	Central	Peripheral	Shape	Location

* The four types of Incidental Learning Tasks (central, peripheral, location, and shape) are described fully under the Procedure section.

Apparatus and Materials

The apparatus consisted of a 35 mm Carousal 800 Slide Projector and a 4 x 5 foot screen. Subjects sat at a desk which was slightly to the right and four feet away from the screen. Eleven sets of seven line-figure complexes were photographed and mounted on standard 2 x 2 inch slides (see Appendix A). The decision to use seven line-figures was based on previous findings (see Chapter II), and on a small number of pilot subjects. These line-figures were adapted from Hawker (1964) to minimize verbal mediation for the nonverbal subjects as much as possible. Both the positions of the angles within the four dots and the locations of the angles within the twelve cells were randomly assigned.

Associated with each line-figure were two trigrams, one central (adjacent to the point where the two lines meet) and one peripheral (placed on the side of the angle). A trigram is a three-letter syllable which does not form a word. The trigrams used were selected from Mechanic (1962), and were controlled for meaningfulness (high)and intra-line-figure similarity (low). Meaningfulness is defined in terms of language frequency of trigrams while intra-line-figure similarity is defined in terms of duplication of letters. The use of these trigrams as incidental learning material is fully described in the Procedure section and examples are given in Figure 2 (p. 24).

Description and Purposes of the Creativity Measures

The RAT is based on an associative approach to the creative process. Within the associative framework, creative thinking is regarded as the process of forming new combinations of or associations among elements.

The more mutually remote the elements utilized, the more creative is the solution regarded. An additional stipulation of this definition is that the solution be useful and appropriate to the specific situation.

The test is composed of 30 three-word items of the following type:

Example I: rat blue cottage

Example II: surprise line birthday

The words are chosen from mutually remote clusters and the task is to find the link between them. For instance, the answers to the above are: cheese and party, respectively.

The validity of the RAT has been established using two basic types of criteria: (a) the ratings of individuals by superiors or by other expert judges, and (b) the ratings of an individual's products (see Chapter II). The reliability of the RAT has been computed on several samples and these studies indicate that it has adequate internal consistency. Split-half coefficients tend to be in the 90's for adult samples (Mednick, 1963) and range from .84 to .96 with children (Mednick, 1962).

The BWAS is drawn from the Welsh Figure Preference Test (1959). Subjects are asked to indicate whether they like or dislike each of a series of 86 abstract designs and drawings. (See Chapter II for validity studies.) Barron and Welsh (1952) found split-half reliability of the BWAS to be .96, thus indicating adequate internal consistency. As a result of the numerous studies on creativity conducted at the Institute of Personality Assessment and Research, Berkeley, it was concluded that the BWAS is "one of the most powerful single tests yet discovered as a predictor of creative potential, not only in the arts but also in the physical sciences and engineering" (Gough, 1964, p. 9). Thus, the scale

seems to be a good nonverbal measure of creative potential.

It has been found that the two measures of creativity are relatively uncorrelated (r=.14; Mendelsohn and Griswold, 1966).

Procedure

The procedure consisted of two stages, a Training Stage and a Testing Stage.

Training

Although all subjects were shown the same seven complexes, six random sequences of the complexes were arranged (see Appendix B). These sequences were presented in a constant order across all groups, i.e.,the first S was given sequence 1, the second, sequence 2, etc. Each of a particular set of seven line-figure complexes was exposed at a five-second rate.

Verbal Learning Groups

Subjects within the verbal learning groups were randomly divided so that one-half were given instructions to anticipate each trigram of seven different trigrams which was centrally located in a particular line-figure (C-P S's). The other one-half were given the same instructions except that they were told to anticipate each trigram of seven different trigrams which was located peripherally in a particular line-figure (P-C S's, see Figure 2a). The S's, participating individually, were seated in front of the screen and given the following instructions:

> "I am going to present a series of complexes on the screen and in each of these complexes you will notice angles with various three-letter words associated with them." [C-P S's were told:

"I want you to identify by writing out each three-letter word which appears at the central point of the angle, that is the word appearing at the juncture of where the two lines meet." P-C S's were told, "I want you to identify by writing out each three-letter word which appears on the peripheral part of the angle, that is the one on the side of the angle." Paper with seven lines per sheet was then given each S. One run through of all seven complexes was performed and a check was made to see that the subject could see the words. The remaining instructions were the same for both groups.] "Now that you have completed that and can identify the words all right, I want you to try and write each word that you just saw prior to its appearance on the screen. For instance, there is no word on the screen now; to begin, you should write in the first word and as soon as you hear the projector click you will know that it is on the screen. You should then look up to see if you are right, and then immediately write in the second word. Then as soon as the projector clicks on the second one, you should look up to see if you are right and then immediately write in the next word; and so on, so that you are always one word ahead but never more than one word ahead. After you have filled all the blanks, I will take the paper and hand you another. You will have five seconds to write the word before the projector switches on the next word. Remember, do not verbalize the word but write it, and do not write more than one word ahead. Are you absolutely sure now what you are to do? All right, write in the first word."

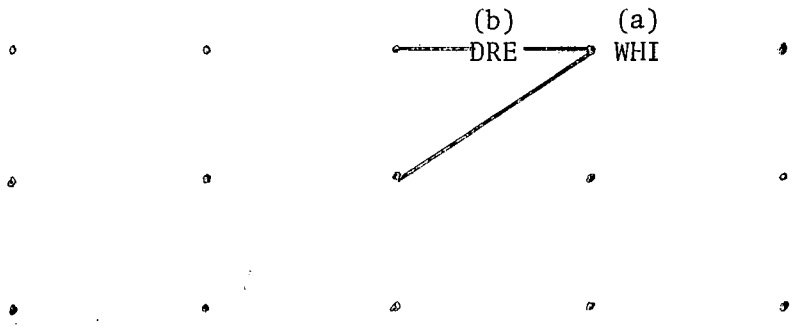

Figure 2a: Use of Trigrams as Incidental Learning (Verbal)

(a) Central S's were asked to learn the trigram located at the juncture of the two lines (WHI).
(b) Peripheral S's were asked to learn the trigram located at the side of one of the two lines (DRE).

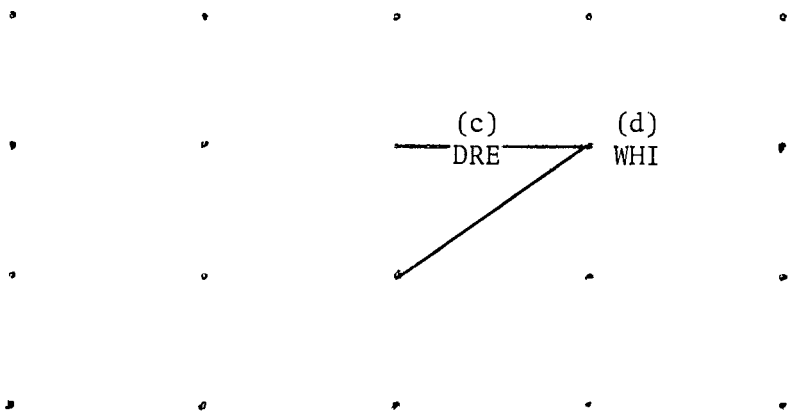

Figure 2b: Use of Angle Shape and Location for Incidental Learning (Nonverbal)

(c) Shape S's were asked to learn the angle as it is drawn among the four dots constituting a cell.
(d) Locations S's were asked to learn the location of the angle in one of the 12 cells.

Nonverbal Learning Groups

Subjects within the nonverbal learning groups were randomly divided so that one half were given instructions to anticipate each shape of seven different shapes of the line-figures (S-L S's). The other one-half were given instructions to anticipate each location of seven different locations of the line-figures (L-S S's; see Figure 2b). The S's participating individually were seated in front of the screen and given the following instructions:

> "I am going to present a series of complexes on the screen and in each of these complexes you will notice various angles in various locations."

Subjects in the S-L group were then instructed as follows:

> "I want you to draw in each angle as it appears on the screen [paper with seven four-dot cells on each sheet was then handed the subject]. You will notice that each angle differs in shape, that is, in terms of whether it is facing up or down, or to the left or

right, as it has been drawn between four dots. [One run through of all seven complexes was performed and a check made to see that the S's could see the angles.] Now that you have correctly drawn in each angle, I want you to draw in each angle on the paper prior to its appearance on the screen. For instance, there is nothing on the screen now; to begin, you should draw in what you think the first angle will look like [pointing to the first four dot cell on the paper] and as soon as you hear the projector click you will know that it is on the screen. You should then look up to see if you are right, and immediately draw in the second angle [pointing to the second four dot cell on the paper]. Then as soon as the projector clicks on the second one, you should look up to see if you are right, and immediately draw in the next one [pointing to the third four dot cell on the paper]; and so on, so that you are always one complex ahead but never more than one complex ahead. After you have filled in all the angles on the paper, I will take it and hand you another."

Subjects in the L-S group were instructed as follows:

"I want you to place a check mark in each location where each angle appears on the screen [paper with seven 12 cell matrices on each sheet was then handed the subject]. You will notice that each of the various angles appears in a different location, that is, each appears in a different cell of 12 possible cell locations. [One run through of all seven complexes was performed and a check made to see that the subjects could see the locations.] Now that you have correctly indicated where each of the angles appears, I want you to place a check in one of the 12 cells on the paper where you think an angle will appear prior to its appearance on the screen. For instance, there is nothing on the screen now; to begin, you should make a check mark where you think the first angle will appear [pointing to the first 12 cell matrix on the paper] and as soon as you hear the projector click you will know that it is on the screen. You should then look up to see if you are right, and immediately make a check where you think the second angle will appear [pointing to the second 12 cell matrix on the paper]. Then as soon as the projector clicks on the second one, you should look up to see if you are right, and immediately make a check where you think the next angle will appear [pointing to the third 12 cell matrix on the paper]; and so on, so that you are always one complex ahead but never more than one ahead. After you have completed making checks on one paper, I will take it and hand you another."

Subjects in both nonverbal groups were then instructed:

"You will have five seconds in which to respond before the projector switches on the next complex. Remember, do not go more than one complex ahead. Are you absolutely sure now what you are to do? All right, begin with the first complex."

Thus, all subjects were given instructions describing the task of learning one of the four dimensions within a complex.

Training continued until a criterion of one perfect trial was reached (with S correctly anticipating all seven complexes along a particular dimension). For the C-P S's, peripheral trigrams were not mentioned in the instructions; for the P-C S's, central trigrams were not mentioned in the instructions. Similarly, for the S-L S's, location was not mentioned in the instructions, and for the L-S S's, shape was not mentioned in the instructions.

Testing

Immediately after S's in the verbal groups reached the criterion, they were given a column of the seven central (or peripheral) trigrams listed in the same sequence as during learning. The C-P S's were asked to correctly match each of the seven central trigrams with one of 12 peripheral trigrams listed in another column. The P-C S's were asked to correctly match each of the seven peripheral trigrams with one of 12 central trigrams listed in another column. Both verbal groups were given the following instructions:

> "Here is a list of the seven words that you learned in order [pointing]. With each of these words that you learned, there was another word on the angle associated with that word. I want you to match each of the three letter words that you learned with the word that accompanied it on the angle. Do this by selecting the appropriate word of the 12 words listed here [pointing] and writing it in the space provided [pointing]. For instance, if you feel any of these 12 words was associated with the first word that you learned, and one of them was, then you would write that word next to the first word you learned [pointing]. Are there any questions on this now? All right, begin, and try to remember as many as you can."

Similarly, S's in the nonverbal groups were given a column of the seven line-figure shapes (or locations) in the same sequence as during learning. The S-L S's were asked to correctly match each of the seven shapes with one of 12 cell locations shown on another paper. The L-S S's were

asked to correctly match each of the seven locations with one of 12 shapes shown on another paper. The S-L S's were given the following instructions:

> "Here is a list of the seven angles that you learned in order [pointing]. Here is another sheet with 12 possible angle locations indicated by a circle in each matrix. As you recall, each angle appeared in various cell locations. I want you to try and match each angle with the appropriate cell location. I want you to do this by drawing each of the seven angles in the location [pointing] where you think each of them appeared when you learned the angles. For instance, if you think you know where the first angle went, you would draw it inside the circle with the location you think is correct. Any questions? All right, begin, and try and remember as many as you can."

The L-S S's were given the following instructions:

> "Here is a list of the seven locations that you learned in order [pointing]. Here is another sheet with 12 possible angle shapes. As you recall, each location had a different angle in it. I want you to try and match each of the locations with the appropriate angle shape. I want you to do this by selecting from here [pointing] one of the 12 angles that you think appeared in each location and draw each of them in the seven locations you learned. For instance, if you think you know which angle belongs in the first location, you would draw it inside that location. Any questions? All right, begin, and try and remember as many as you can."

Upon completing the testing session, all subjects were asked not to discuss the experiment with anyone else until the experiment was completed.

Scoring consisted of counting the number of incidental cues correctly matched and the trials required to reach criterion. Thus, two scores were recorded for each subject.

CHAPTER IV

RESULTS

The results section consists of two parts. The first presents the pre-experimental analyses; the second presents the experimental analyses.

Pre-experimental Analyses

Two separate analyses of variance were computed in the pre-experimental phase. The first was run to determine whether the eight groups of RAT subjects differed significantly on their BWAS scores. The second was run to determine whether the eight groups of BWAS subjects differed significantly on their RAT scores. The summary of these analyses, presented in Tables II and III, reveals no significant differences.

The correlation between the RAT and BWAS scores for 240 subjects was found to be .11. This finding is consistent with that of Mendelsohn and Griswold (1966) who report that these are relatively independent measures.

Experimental Analyses

Of primary interest was the analysis of variance on the four factors in this study. The factors were as follows: 1) Test (BWAS and RAT), 2) Creativity level (high and low), 3) Sex, and 4) Learning task

TABLE II

ANALYSIS OF VARIANCE OF BWAS SCORES
FOR RAT SUBJECTS

Source	df	MS	F
RAT Subgroups	7	13.66	-
Error	40	166.04	-
Total	47		

TABLE III

ANALYSIS OF VARIANCE OF RAT SCORES
FOR BWAS SUBJECTS

Source	df	MS	F
BWAS Subgroups	7	.84	-
Error	40	15.50	-
Total	47		

(verbal and nonverbal). Table IV presents this analysis. From this table, it can be seen that the Creativity factor ($p = < .001$), Sex factor ($p = < .05$), and Creativity x Sex interaction ($p = < .05$) were all significant.

Since the nature of the task was such that some groups of subjects took more trials to reach the criterion of one perfect trial than others, an analysis of variance was performed on the trials-to-criterion scores (see Table V). Since this analysis reveals that there were significant differences among groups in trials-to-criterion scores, it is possible that the number of trials-to-criterion had some effect on the incidental learning scores. An analysis of covariance was done to control for this possible effect of trials-to-criterion on incidental learning scores. Table VI presents this analysis, while Table VII shows the changes in group means in incidental learning scores after adjustment was made on the basis of the regression of incidental learning on trials-to-criterion.

The covariance analysis indicates three significant main effects and one significant interaction effect. These are as follows: Creativity ($p = < .001$), Sex ($p = < .01$), Learning Task ($p = < .01$), Creativity X Sex ($p = < .01$). Except for the Learning Task factor, these results are in fairly close agreement with those obtained by the analysis of variance (Table IV). This is consistent with the low correlation found between trials-to-criterion and incidental learning scores ($r = -.08$).

TABLE IV

ANALYSIS OF VARIANCE FOR THE FOUR EXPERIMENTAL FACTORS

Source	df	MS	F
Test (T)	1	.09	-
Creativity (C)	1	23.01	19.22***
Sex (S)	1	7.59	6.36*
Learning Task (L)	1	3.01	-
T X C	1	.26	-
T X S	1	.26	-
T X L	1	1.26	-
C X S	1	7.59	6.36*
C X L	1	.01	-
S X L	1	.51	-
T X C X S	1	.01	-
T X C X L	1	.01	-
T X S X L	1	3.76	-
C X S X L	1	.26	-
T X C X S X L	1	1.76	-
Error	80	1.19	-
Total	95		

* $p = < .05$
*** $p = < .001$

TABLE V

ANALYSIS OF VARIANCE OF TRIALS-TO-CRITERION SCORES

Source	df	MS	F
Experimental Subgroups	15	88.77	3.46*
Error	80	25.62	-
Total	95		

* p = < .05

TABLE VI

ANALYSIS OF COVARIANCE FOR THE FOUR FACTORS

Source	df	MS	F
Tests (T)	1	.00	-
Creativity (C)	1	21.02	18.93***
Sex (S)	1	9.88	8.90**
Learning Task (L)	1	8.14	7.28**
T X C	1	.04	-
T X S	1	.15	-
T X L	1	2.14	-
C X S	1	9.32	8.39**
C X L	1	.02	-
S X L	1	.01	-
T X C X S	1	.14	-
T X C X L	1	.69	-
T X S X L	1	4.16	-
C X S X L	1	.56	-
T X C X S X L	1	1.71	-
Error	79	1.11	-

** p = < .01
*** p = < .001

TABLE VII

DISTRIBUTION OF MEANS FOR THE 16 GROUPS

			Trials to Criterion	Incidental Learning	Adjusted Means For Incidental Learning
			Mean	Mean	Mean
RAT	Low	Male	Verbal	12.33	1.33	.61
			Nonverbal	20.00	1.50	5.30
		Female	Verbal	9.83	1.00	1.19
			Nonverbal	20.50	2.00	6.09
	High	Male	Verbal	10.50	1.66	.14
			Nonverbal	11.33	2.16	.85
		Female	Verbal	10.33	2.83	.94
			Nonverbal	17.83	3.50	6.02
BWAS	Low	Male	Verbal	11.00	1.16	.34
			Nonverbal	11.50	2.16	.95
		Female	Verbal	11.83	2.00	.99
			Nonverbal	14.16	1.16	1.52
	High	Male	Verbal	10.66	1.83	.13
			Nonverbal	15.16	2.16	3.11
		Female	Verbal	10.16	3.00	1.00
			Nonverbal	19.66	3.00	6.60

The significant Creativity X Sex interaction indicates that these factors are not independent. Thus, it is necessary to examine the simple effects of both factors (see Table VIII and Figure 3). Inspection of Table VIII indicates that the difference between high and low creative males in incidental learning is not significant, while that between high and low creative females is highly significant. Furthermore, the fact that there is no significant difference between low creative males and females and a highly significant difference between high creative males and females indicates that much of the variance in incidental learning scores is accounted for by the high creative females. An illustration of these effects is shown in Figure 3.

TABLE VIII

ANALYSIS OF SIMPLE EFFECTS FOR C X S INTERACTION

Treatment Comparison	df	MS	F
Between High and Low Creativity Groups within Males	1	2.08	-
Between High and Low Creativity Groups within Females	1	28.50	23.95**
Between Male and Female Groups within Low Creativity	1	0.00	-
Between Male and Female Groups within High Creativity	1	15.10	12.81**

** $p = < .01$

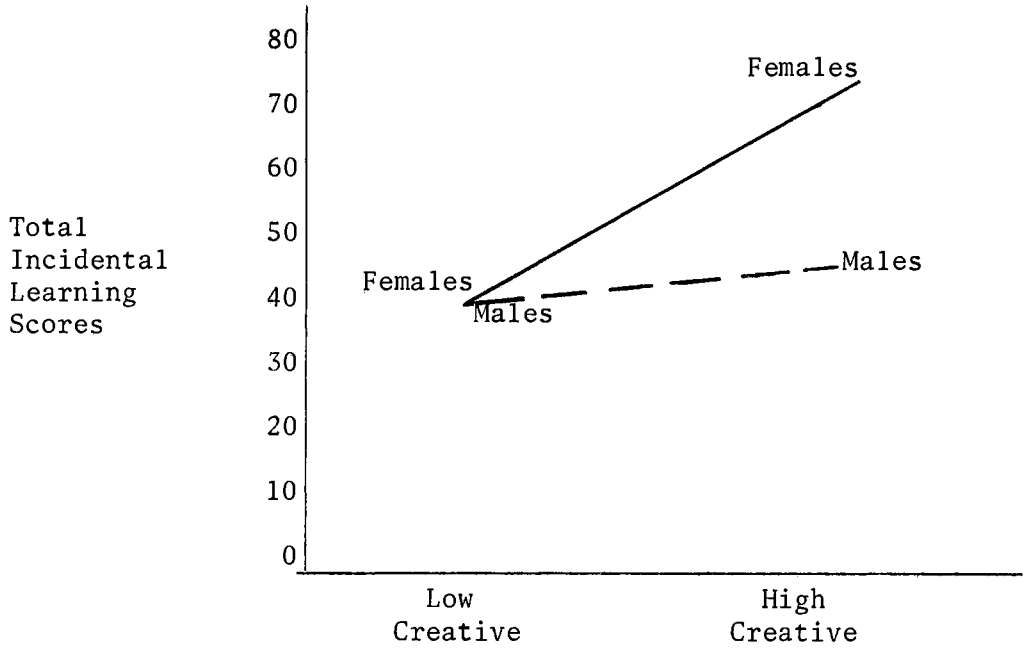

Figure 3: Illustration of the Creativity X Sex Interaction

Learning Task was the only factor that changed significantly after the adjustment was made for trials-to-criterion. Inspection of Table IX indicates the large differences in total mean incidental learning scores for verbal and nonverbal groups, once incidental learning score means are adjusted for trials-to-criterion. As can be seen, the overall adjusted mean for the nonverbal group is significantly higher than the overall adjusted mean for the verbal group.

TABLE IX

OVERALL MEAN INCIDENTAL LEARNING SCORES
FOR VERBAL AND NONVERBAL GROUPS

	Unadjusted Incidental Learning Mean Score	Adjusted Incidental Learning Mean Score
Verbal	14.91	5.34
Nonverbal	17.64	30.44

CHAPTER V

DISCUSSION

The findings of the present investigation suggest that creativity is a unitary phenomenon. This is based on the fact that the Remote Associates Test and Barron-Welsh Art Scale were equally effective in predicting incidental learning scores. However, this unitary quality cannot be considered apart from sex differences, since the effect of creativity level on incidental learning was demonstrated with females but not males.

The results clearly indicated that for females, both Remote Associate Test scores and Barron-Welsh Art Scale scores are associated with greater sensitivity to environmental cues, regardless of whether these cues are verbal or nonverbal. Although results for the male subjects were in the predicted direction, they did not reach significance. This finding indicates that generalizations about creative functioning based on only one sex are of doubtful validity and is consistent with findings in many areas of research (see, e.g., Tyler 1965, pp. 239-272).

Since so few studies in the areas of creativity and incidental learning have explored possible sex differences, it is difficult to account adequately for those found in the present study. However, several investigators have reported that females excel males in memory for verbal and geometric materials (Havinghurst & Breese, 1947); in the perception of details (Gainer, 1962); and in attentiveness to a visual

field in which perceptual patterns are embedded (Witkin, 1954). Moreover, Cashdan and Welsh (1966) and Helson (1966) report that high creative females are less unmotivated, dependent, and passive than low creative females, and that they assume an achievement oriented, independent, and dominant role more similar to that of the male. It is possible that the heightened motivation and achievement orientation coupled with the superior perceptual-memorizing abilities might account for the significantly higher incidental learning scores of high creative females as compared to high creative males. The less motivated and achievement oriented qualities demonstrated by low creative females possibly offsets any perceptual-memorizing advantages, and results in performance that is similar to the low creative male.

The findings of the present study indicate that creativity is a unitary phenomenon in both males and females. Contrary to the findings reported by Mendelsohn and Griswold (1966), the Barron-Welsh Art Scale scores were significantly "related to the incidental learning of verbal information." This discrepancy in findings might be partially accounted for by differences in the measures of attention employed and by differences in procedure. For example, Mendelsohn and Griswold (1966) defined attention on the basis of the acquisition of verbal incidental information provided the subjects for use in a later problem-solving task. In the present investigation, both verbal and nonverbal cues were presented visually and the subjects were not required to utilize these cues in a later problem-solving task, i.e., subjects in the present study were merely required to recognize the incidental materials, while subjects in the Mendelsohn and Griswold study were required to solve a series of anagrams on the basis of what they had learned intentionally

and incidentally.

Another result was the significantly higher scores obtained by subjects who learned nonverbal incidental material as compared to those who learned verbal incidental material. One explanation for this finding might involve differences in the nature of the learning tasks required of the two groups. Verbal subjects were merely required to learn a particular nonsense syllable without necessarily focusing attention on the total complex presented. Nonverbal subjects, however, were forced to focus attention on the entire complex in order to learn a particular shape or a particular location. This might result in verbal subjects attending to only that dimension of the complex they were instructed to learn, thus they would not be as likely to learn the incidental materials as the nonverbal subjects.

Suggestions for Research

The present study focuses on certain individual differences in perception and cognition which may be preconditions for creative activity. A number of related studies exploring these differences suggest themselves. First, the use of other measures or criteria of creativity is necessary. For instance, Laughlin (1967) states that the *"underlying process"* of creativity and incidental learning is the ability to form and retain incidental or remote associations. Since Laughlin's study employed only verbal materials, it would be useful to know whether or not this *"underlying process"* can account for findings involving nonverbal materials as well. Secondly, more research is indicated in specifying whether the reception or acquisition of incidental cues involves the same processes as the later utilization of

these cues in certain problem-solving situations. Finally, information is needed regarding the extent of sex differences in the areas of creativity as well as incidental learning.

CHAPTER VI

SUMMARY AND CONCLUSIONS

The purpose of the present investigation was to examine some of the theoretical positions and a few of the variables relating to creativity when viewed as a process. A review of theoretical approaches and previous experimental led to the posing of the following questions: 1) Do high creative and low creative individuals (as determined by a verbal test) differ in terms of verbal and/or nonverbal visual measures of attention? 2) Do high creative and low creative individuals (as determined by a nonverbal test) differ in terms of verbal and/or nonverbal visual measures of attention? 3) Do males and females differ in terms of performance in an *"attention"* situation?

In order to examine these questions, 96 subjects, selected on the basis of their scores attained on the Remote Associates Test and the Barron-Welsh Art Scale, participated in the following experimental procedure. The procedure involved a two-stage incidental learning design consisting of a training phase and a testing phase. During the training phase, half the subjects serially learned one of two possible sets of verbal stimuli while the remaining subjects learned one of two possible nonverbal (i.e., spatial) dimensions. The testing phase consisted of a recognition task requiring subjects to recall stimulus material on which they had not been trained.

The major findings were: 1) Performance of high creative females

was significantly better than that of low creative females. 2) No significant differences were found between high creative males and low creative males, although the difference was in the predicted direction. 3) Performance of high creative females was significantly better than that of high creative males, although this difference was not found for the low creative subjects. 4) The findings were the same whether a verbal or nonverbal measure of creativity was employed. The latter supports the hypothesis that creativity is a general unitary concept, so that verbal and nonverbal measures of creativity enable successful prediction of performance in both nonverbal and verbal situations.

Following a discussion of these results, several suggestions for future research were indicated.

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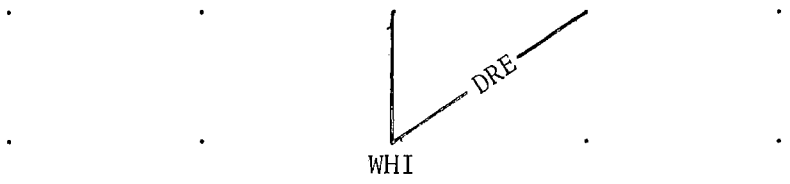
APPENDIX A

ILLUSTRATION OF THE SEVEN LINE-FIGURE COMPLEXES

Complex #1



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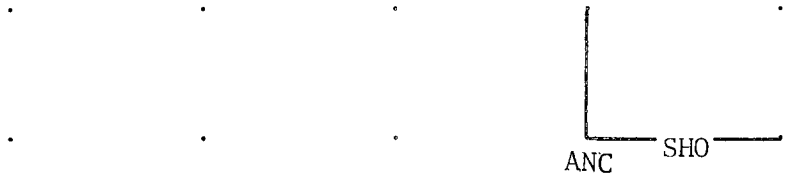
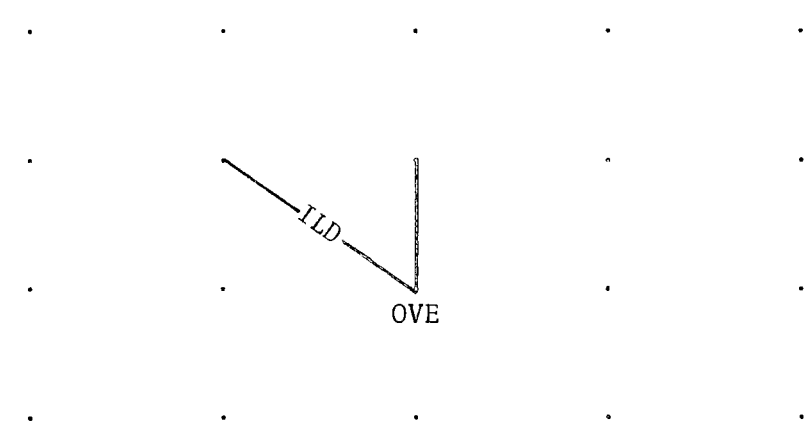


APPENDIX A Continued

ILLUSTRATION OF THE SEVEN LINE-FIGURE COMPLEXES

Complex #3

Complex #4

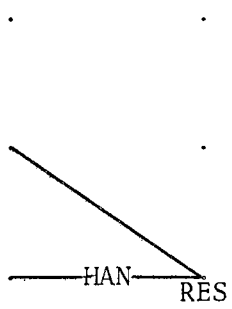


APPENDIX A Continued

ILLUSTRATION OF THE SEVEN LINE-FIGURE COMPLEXES

Complex #5

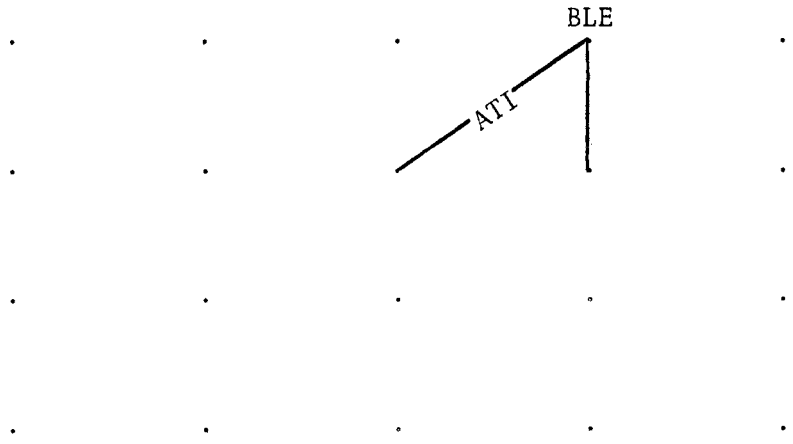
Complex #6



APPENDIX A Continued

ILLUSTRATION OF THE SEVEN LINE-FIGURE COMPLEXES

Complex #7



APPENDIX B

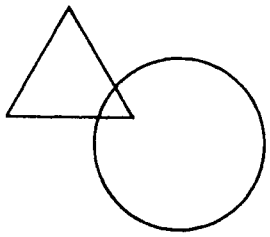
A LIST OF THE SIX RANDOM SEQUENCES OF COMPLEXES PRESENTED

	Complex Position	Central	Peripheral		Complex Position	Central	Peripheral
#1				#4			
	1	WHI	DRE		2	ANC	SHO
	2	ANC	SHO		3	TES	UST
	3	TES	UST		5	GRA	UND
	4	OVE	ILD		6	RES	HAN
	5	GRA	UND		4	OVE	ILD
	6	RES	HAN		1	WHI	DRE
	7	BLE	ATI		7	BLE	ATI
#2				#5			
	4	OVE	ILD		6	RES	HAN
	6	RES	HAN		4	OVE	ILD
	1	WHI	DRE		7	BLE	ATI
	7	BLE	ATI		1	WHI	DRE
	3	TES	UST		5	GRA	UND
	5	GRA	UND		3	TES	UST
	2	ANC	SHO		2	ANC	SHO
#3				#6			
	5	GRA	UND		7	BLE	ATI
	1	WHI	DRE		2	ANC	SHO
	7	BLE	ATI		6	RES	HAN
	3	TES	UST		4	OVE	ILD
	2	ANC	SHO		1	WHI	DRE
	6	RES	HAN		3	TES	UST
	4	OVE	ILD		5	GRA	UND

APPENDIX C

BARRON-WELSH ART SCALE

(Sample Sheet)



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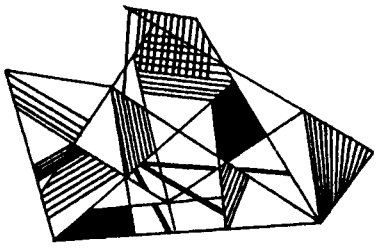

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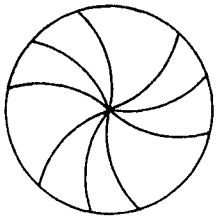

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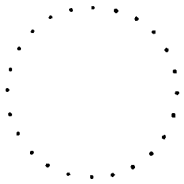
6



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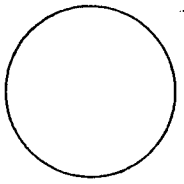

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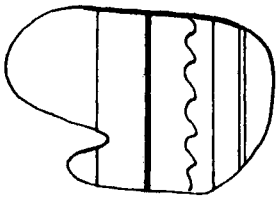

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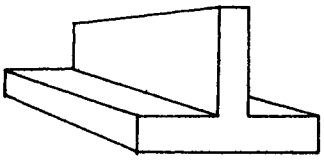

8

APPENDIX C Continued

THE REMOTE ASSOCIATES TEST

1.	stop	petty	sneak	_____	1
2.	elephant	lapse	vivid	_____	2
3.	lick	sprinkle	mines	_____	3
4.	shopping	washer	picture	_____	4
5.	stalk	trainer	king	_____	5
6.	sea	home	stomach	_____	6
7.	walker	main	sweeper	_____	7
8.	mouse	sharp	blue	_____	8
9.	envy	golf	beans	_____	9
10.	board	magic	death	_____	10
11.	athletes	web	rabbit	_____	11
12.	pot	butterflies	pump	_____	12
13.	bald	screech	emblem	_____	13
14.	note	dive	chair	_____	14
15.	cherry	time	smell	_____	15
16.	Southern	console	station	_____	16
17.	chocolate	fortune	tin	_____	17
18.	bass	complex	sleep	_____	18
19.	wicked	bustle	slicker	_____	19
20.	skunk	kings	boiled	_____	20
21.	habit	pouch	Road	_____	21
22.	soap	shoe	tissue	_____	22
23.	blood	music	cheese	_____	23
24.	room	Saturday	salts	_____	24
25.	widow	bite	monkey	_____	25
26.	chamber	staff	box	_____	26
27.	inch	deal	peg	_____	27
28.	puss	spit	spoiled	_____	28
29.	jump	kill	bliss	_____	29
30.	sore	shoulder	sweat	_____	30

VITA

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Doctor of Philosophy

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