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GRADUATE COLLEGE

THE RELATIONSHIP BETWEEN COGNITIVE STYLE, CREATIVITY AND FLEXIBILITY

A DISSERTATION

SUBMITTED TO THE GRADUATE FACULTY

in partial fulfillment of the requirement for the

degree of

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BY

JACK E. TAYLOR

Norman, Oklahoma

1978

THE RELATIONSHIP BETWEEN COGNITIVE

STYLE, CREATIVITY AND FLEXIBILITY

APPROVED BY

DISSERTATION COMMITTEE

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ABSTRACT

THE RELATIONSHIP BETWEEN COGNITIVE STYLE, CREATIVITY AND FLEXIBILITY

Problem

The problem of this research was the nature of the relationship between cognitive style, flexibility and creativity. The questions examined in this study were:

(1) Can creativity be predicted by means of cognitive style and flexibility?

(2) What is the interrelationship of cognitive style, flexibility and creativity?

(3) Are field-dependent cognitive style and high measures of flexibility necessary for greater creativity.

The purpose of this study was to evaluate both the interaction between these variables and also study the degree to which measures of flexibility and cognitive style predict measures of creativity.

The first general hypothesis is that flexibility and field-independence will have an interactional effect with regard to high creativity scores. A sub-hypothesis states that field-independent subjects will also score higher as a group than field-dependent subjects on measures of flexibility. A second sub-hypothesis states that field-independent subjects will score higher on creativity measures than will field-dependent subjects. A third sub-hypothesis states that high flexible subjects will score higher than low flexible subjects on measures of creativity.

The second general hypothesis states that the variables flexibility and cognitive style will be predictors of creativity. Two additional questions were examined as sub-parts of this hypothesis. One related to the degree to which uniqueness of creativity and quantity of creativity were predicted by the separate independent variables. The second question examined how the measures of reversibility, category width and cognitive style predict creativity.

Procedure

The sample for this research was 52 graduate students enrolled in educational administration courses at the University of Oklahoma. There were 22 males and 30 females and their mean age was 33 years. These subjects were tested for cognitive style with the Group Embedded Figures Test (GEFT); for flexibility with the Reversible Cube (RC) test and the Category Width Test (CW). They were tested for creativity with the Wallach-Kogan Creativity Test (W-KCT).

In the first stage of the analysis of the data, an intercorrelational matrix examined the degree of relationship between the eighteen included variables. From this the variables were reduced to three: one measure for cognitive style, one index of flexibility and a composite measure of creativity.

In the second stage of the analysis, the student t-Test provided a comparison of subgroup means formed in the high and low cognitive style score, high and low flexibility scores, and high and low creativity scores. With this elementary comparison a basic understanding of the subgroup composition was established.

Following the t-Test a series of one-way analysis of variance procedures was conducted. It was the intention of this phase of the study to focus on the interrelationship of the three principle variables: cognitive style, flexibility and creativity. This analysis was conducted using the two independent variables, cognitive style and the flexibility to indicate their interrelationship to creativity in terms of quantity of responses, creativity in terms of uniqueness of responses and creativity as a combined measure of quantity and uniqueness.

The third major stage of the analysis was a series of stepwise multiple regression analyses which sought to select the strongest predictor variables of creativity. The first regression entered all the components in an effort to determine priority and importance of the subparts of the three major variables. This lead to the next application of regression procedures to examine the separate contributions of the GEFT, RC and CW scores in predicting both

quantitative and uniqueness characteristics of creativity. This was accomplished through three subsequent regression procedures.

Summary of Findings

1. The associative theory of creativity that unique creativity responses are positively related to the quantity of associations produced was supported in this study. This study found the level of significance to be .01.

2. The Wallach-Kogan Creativity Test demonstrated internal consistency. This instrument appears to provide a reliable measure of associative creativity.

3. The flexibility index showed that there was no distinction on this measure by either age or sex suggesting the possibility in keeping with more recent research on rigidity that increase in age does not automatically predict an increase in rigidity.

4. The flexibility index showed important correlation to both creativity and cognitive style but could not distinguish between high and low cognitive styles, and only provided a limited predictor of creativity.

5. Both the Reversible Cube (RC) measure and the Category Width Test (CWT) indicated substantial relationships to measures of creativity and cognitive style and showed low intercorrelation. It appears that these measures may be separate components of some yet unknown quality of flexibility.

6. Cognitive styles were found to be unrelated to age and sex difference. In this study, 60% of the females were field-independent while only 32% of the males were. This does not support earlier findings by Witkin that females are slightly more field-dependent than males.

7. The theory of differentiation suggested that field-independents may be either "fixed" or "mobile." That is they have the ability to move from field-independence to field-dependence. This study found no support for this theory. Flexibility was not differentially distributed among the subjects based on cognitive style.

8. There was no interaction effect found between cognitive style and flexibility in relationship to creativity. Both cognitive style and flexibility demonstrated significant main effects with creativity.

9. The final analysis of creativity predictors revealed cognitive style as the most important single predictor.

THE RELATIONSHIP BETWEEN COGNITIVE STYLE, CREATIVITY AND FLEXIBILITY

CHAPTER I

INTRODUCTION

Background of the Study

The study of individual differences and abilities during the past 40 years has led to the development of three separate domains: intelligence, cognitive styles and creativity. The pioneering research was in the identification of intelligence. Galton and Cattell were early researchers in the quality of cognitive functioning. The work of Witkin and his associates firmly established cognitive styles as distinct and separate from intelligence.[1] With the work of Wallach and Kogan, conclusive evidence was

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[1]H. A. Witkin et al., Psychological Differentiation (New York: Wiley, 1962).

presented to establish creativity as a separate domain which is not a function of intelligence.[2]

In both the study of creativity and cognitive styles one variable has emerged that appears to be essential to both cognitive development as interpreted by Witkin and creativity as conceptualized by Wallach and Kogan. That variable is called flexibility in this study. If this is the case, it is expected that flexibility will be present in both of these operations. More specifically, it is expected that flexibility will be a determining quality in cognitive style and creativity. The grounds for the conceptual problem are therefore laid. In what way are these three variables interrelated?

The concepts of creativity, cognitive style and flexibility require clarification regarding their conceptual meaning and interrelationship. However, before doing this, it will be helpful to distinguish creativity and cognitive style from the concepts of cognitive strategy and general ability. Cognitive style, cognitive strategies, creativity and general ability are separate domains.

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[2]M. A. Wallach and N. Kogan, Modes of Thinking in Young Children (New York: Holt, Rinehart and Winston, 1965).

Messick[3] and Kogan[4] present thorough reviews of the research and theoretical literature for those distinctions. Cognitive strategies are decision-making regularities in information processing that are a function of particular situations or task requirements. They are organizing mediators of information used in processing such as groupings and hypothesis testing strategies.[5]

Cognitive styles, on the other hand, are viewed as habitual ways of organizing and processing information and experience. They are rooted in personality structures. Affective, temperamental and motivational core structures of the personality manifest themselves in the various psychological domains of functioning--intellectual, affective, motivational--and its manifestation in cognition is cognitive style.

Cognitive style is also not the same thing as ability. Ability refers to the content of cognition.

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[3]S. Messick, "Personality Consistencies in Cognition and Creativity," in Samuel Messick and Associates, Individuality in Learning (San Francisco: Jossey-Bass Publishers, 1976).

[4]N. Kogan, "Educational Implications of Cognitive Styles," in G. S. Lesser (ed.), Psychology and Educational Practice (Glenview, Ill.: Scott Foresman, 1971).

[5]J. S. Bruner; J. J. Goodnow; and G. A. Austin, A Study of Thinking (New York: Wiley, 1956).

Cognitive style is concerned with the manner in which that content is processed.[6] The cognitive style specified in this study is that identified by Witkin and his associates as field-independence/field-dependence. Field-independence will be examined in detail later.

With these differences in mind, the similarities between the concepts of cognitive style, creativity and flexibility can now be examined. First, the qualities of the field-independent cognitive style and qualities of associative creativity seem to share some common elements. Creativity is defined in this study in associationistic terms.[7] Associative creativity is that thinking process by which the individual is able to maintain a wide contact with both near and remote associative elements. Field-independence is a perceptual and cognitive preference manifest in the individual's analytic manipulation of the contextual stimuli in such a manner that the parts can be held separate from the whole. It refers as well to symbolic

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[6]Kogan, "Educational Implications."

[7]S. A. Mednick, "The Associative Basis of the Creative Process," in M. T. Mednick and S. A. Mednick (eds.), Research in Personality (New York: Holt, Rinehart and Winston, Inc., 1964); and Wallach and Kogan, Modes of Thinking, pp. 13-20.

representations in thinking and problem-solving and to the perceptual context. Associative creativity and field-independent analytical style appear, then, to be quite similar capacities. In fact Kogan[8] suggests that perhaps creativity (as associative uniqueness) might be classified as a cognitive style.[9] These similarities are examined in more detail in the following paragraphs.

As already mentioned, field-independence refers to an individual's perceptual style which allows the disembedding of elements from the stimulus configuration of the perceptual field and also is manifest in the person's dealing with symbolic representations as in thinking and problem-solving. It is that mental process of disembedding, of freely manipulating those symbolic representations used in thinking and problem solving. As Witkin et al. stated it:

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[8]Kogan, "Sex Differences in Creativity and Cognitive Styles," in Samuel Messick and Associates, Individuality in Learning (San Francisco: Jossey-Bass Publishers, 1976), p. 105.

[9]See also S. Messick and N. Kogan, "Differentiation and Compartmentalization in Object-Sorting Measures of Categorizing Style," Perceptual and Motor Skills, 1963, 16, 47-51; and Wallach and Kogan, "A New Look at the Creativity-Intelligence Distinction," Journal of Personality, 1965, 33, 348-369.

> The individual, who, in perception, cannot keep an item separate from the surrounding field--in other words, who is relative field dependent--is likely to have difficulty with that class of problems, and, we must emphasize, only with that class of problems, where the solution depends on taking some critical element out of the context in which it is presented and restructuring the problem material so that the item is now used in a different context.[10]

The field-independent person, when presented with a field having a dominant organization, therefore, is able to overcome the organization of both perceptual and cognitive fields, and is also able to restructure it. The field-dependent person tends to adhere to the organization of the field as given. What Witkin calls "restructuring the organized field" sounds very similar to what the associationists refer to as forming associative elements into new and useful combinations--associative uniqueness, creativity.[11]

The definition of the associative concept of creativity used by some associationists comes from the mathematician Poincare:

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[10]Witkin et al., "Field-Dependent and Field-Independent Cognitive Styles and Their Educational Implications," Review of Educational Research, Winter, 1977, Vol. 47, No. 1, p. 8.

[11]Wallach, "Creativity," in P. H. Mussen, ed. Carmichael's Manual of Child Psychology, Vol. 1 (New York: Wiley, 1970); Wallach and Kogan, Modes of Thinking; and Wallach and Kogan, "Creativity-Intelligence Distinction."

> . . . to create consists of making new combinations of associative elements which are useful . . . unsuspected kinships between other facts well known but wrongly believed to be strangers to one another. Among chosen combinations the most fertile will often be those formed of elements drawn from domains which are far apart.[12]

Creative thinking for the associationist is, therefore, the process of forming associative elements into new combinations which either meet specified requirements or are in some way useful. The more mutually remote the elements of the new combination, the more creative the process or solution. Said in another way creativity is that ideational fluency by which means the individual is able to scan and retrieve remote, though appropriate, information for use in new contexts.

The importance of the third variable in this study may now be apparent. It is a quality designated as flexibility (also called mobility, as well as its reverse concept, rigidity). It is this quality that is proposed as the link between the cognitive style field-independence and creativity. Witkin et al., based on the deferentiationist theory of Werner, stated that the growth toward field-independence is a developmental process through which

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[12]H. Poincare, "Mathematical Creation," The Foundation of Science (Lancaster: The Science Press, 1946).

the individual grows from a global to an analytical mode of operation.[13] A field-independent person's thinking and perception are more complex and differentiated than the field-dependent person's. The theory further stated that some people may be fixed in either the field-dependent or the field-independent mode, but that there are some field-independents who have the ability to shift between the modes. They are mobile.

The more highly differentiated person, the field-independent, can consciously exert greater control over his perceptual and cognitive field than can the less differentiated person. This control was measured in terms of flexibility related to figure-ground shift and the ability to organize perceptual and cognitive field forces, rather than submitting to them. Using the Necker reversible cube, Witkin and his colleagues found that under instruction to control the rate of fluctuation, there is a significant correlation between rate and reversals and field-independence.[14] Upon this finding the Werner-Witkin principle of differentiation that allows shift in developmental level, hypothesizes

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[13]H. Werner, Comparative Psychology of Mental Development (Chicago: Follett, 1948).

[14]Witkin et al., Psychological Differentiation.

the further possibility that mobility is a function of degree of field-independence. Therefore, some field-independent persons should possess mobility.[15]

This analytical-global shift is also thought to be closely associated with definitions of creativity.[16] It is expected that both of these qualities would be necessary for the person to engage his environment in a creative manner. That is, both awareness of total perceptual field and, at the same time, the ability to select particular stimuli from the field even in the face of more salient environmental distractors should characterize the creative person. It is assumed, therefore, that the highly creative person can both overcome the "embedding" quality of his perceptual field, and also discriminate between salient and

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[15]See H. A. Witkin and D. R. Goodenough, "Field Dependence Revisited," Research Bulletin (Princeton, N. J.: Educational Testing Service, December 1976).

[16]M. Bloomberg, "Creativity as Related to Field Independence and Mobility," Journal of Genetic Psychology, 1971, 118, 3-12; A. C. Del Gaudio, "Psychological Differentiation and Mobility as Related to Creativity," Perceptual and Motor Skills, 1976, 43, 831-841; B. Mackler and F. C. Shontz, "Life Styles and Creativity: A Review," The Journal of Psychology, 1964, 58, 205-214; L. D. Noppe and J. M. Gallagher, "A Cognitive Style Approach to Creativity Thought," Journal of Personality Assessment, 1977, 41, 1, 85-90; M. Dellas and E. L. Gaier, "Identification of Creativity: The Individual," Psychology Bulletin, 1969, 73, 1, 55-73.

nonsalient features according to some wider conceptual scheme. If this is the case, high creatives will not only be flexible/field-independent, but will also exhibit fewer stereotyped associations to the perceptual field stimuli. The associative gradient for high creatives will be flat rather than steep to use Mednick's terms[17](See Figure 2, p. 11). The high creatives, thereby, exercise greater production of associative response and also more unique responses. These responses, in turn, will act as more relevant-creative organizers (conceptualizers) of the perceptual field. Thus flexibility appears to be the connecting link between field-independent style and creativity. A conceptual model depicting these diagrammatical relationships is offered in Figure 1.

The author offers this model to suggest the manner in which the variables of this study may be related. The response in both thinking and perception differ according to the two qualities of flexibility and cognitive style. Cognitive style is here described as the degree of differentiation as measured in field-dependent and field-independent. Conceptually it is assumed that the processes of thinking, or conceptualization, and perception are congruent

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[17]S. A. Mednick, "The Associative Basis."

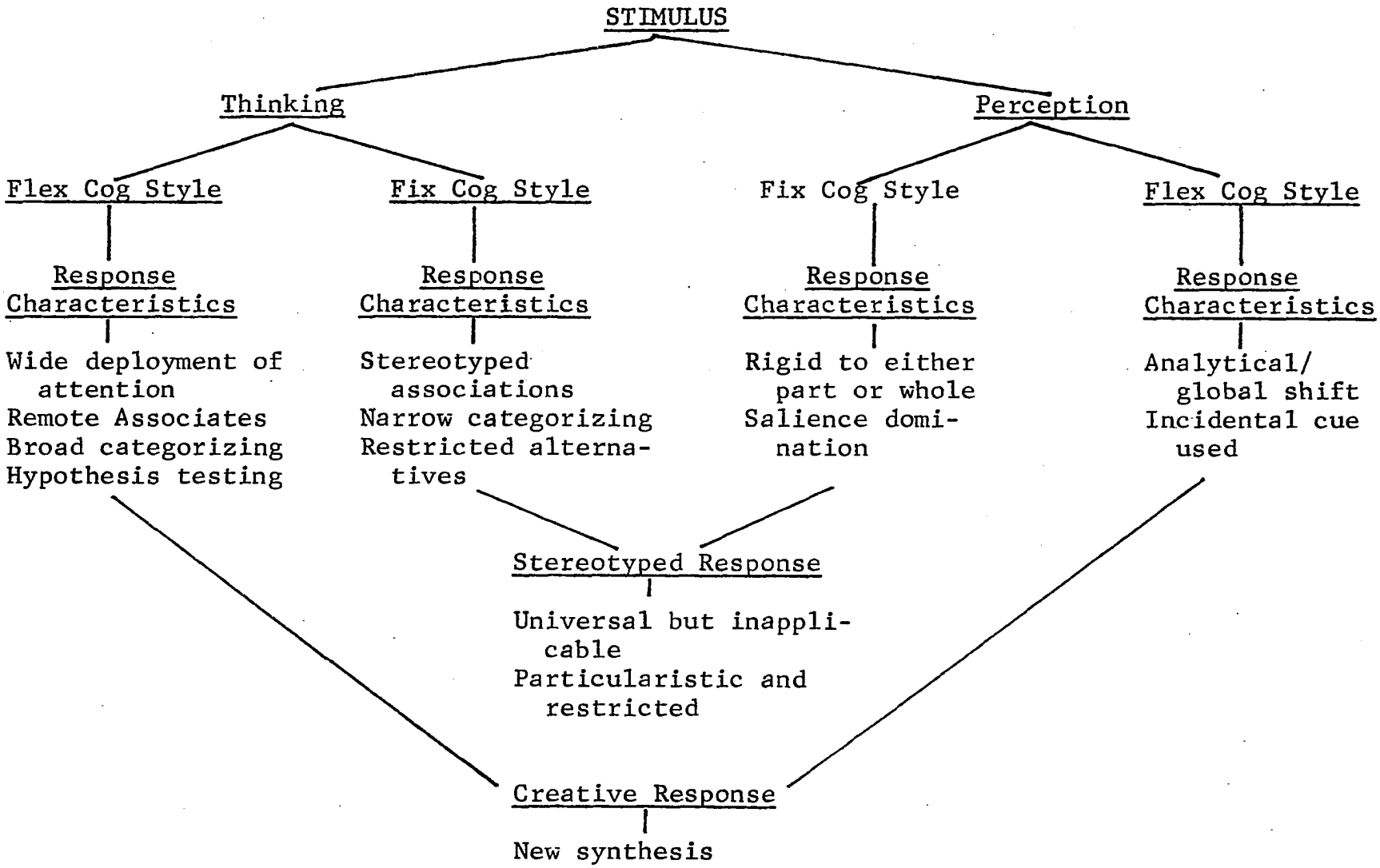


Figure 1. Conceptual Model of the Relationship Between Cognitive Styles, Flexibility and Creativity

within the individual's functioning. In the model the parallel functioning of the flexible cognitive style in thinking and perception lead to equally compatible responses. In the case of thinking the response follows the pattern of wide deployment of attention, broad categorizing, a low gradient of remote associatives, all of which make possible extensive hypothesis testing. This process is augmented in the perceptual realm with a capability to shift from global to analytical and analytical to global perception. This coupled with the influence of incidental cues makes possible a creative response which constructs a new and appropriate synthesis from the stimuli.

On the other hand, this model suggests that the fixed cognitive style responds in the thinking process with stereotyped associations, and narrow categorizations which permit only restricted (familiar) alternatives. This limiting process is aided in the perceptual realm by rigid modes of perceiving that focus only on the global field or only on the isolated parts. In addition perception is dominated by the salient aspects of the perceptual field. Therefore, this combination of fixed cognitive style and fixed perception lead to a stereotyped response which is either universalistic and inapplicable to any particular

instance or it is particularistic and thereby restricted to only the immediate instance.

This review of theoretical concepts highlights the fact that there is no general theory binding together the concepts of cognitive style, creativity and flexibility. Cognitive styles have been studied in terms of the ways an individual approaches his environment, processes information about that environment, stores and uses that information. These studies have examined cognitive styles in terms of broad, underlying personality characteristics. The research is largely in the field of educational and developmental psychology, and has been conducted mostly with children.

Research on creativity has been done in a number of areas, especially in the field of decision-making, problem-solving and intelligence, and in the psychology of creative activity. Studies have covered a wide array of groups including people in creative professions, school children and the emotionally disturbed. The research on creativity is widely diverse and has focused on the creative person, the creative process and the creative product.

Studies in flexibility have been conducted in both areas directly related to field-independent cognitive

styles and in studies of creativity. Flexibility has been identified in relationship to personality characteristics, intelligence and problem-solving abilities.

This study confronts the problem of how these three qualities are interrelated. How a person searches for and processes available information (cognitive style) and the person's degree of flexibility may be predictive of how that person makes decisions and solves problems (creatively or noncreatively) based on that information. It is the purpose of this research to investigate the interaction between these three processes and determine how one may influence or determine the other. There is little research which compares cognitive styles with measures of creativity and flexibility. This present study is an attempt at this comparison. It is hypothesized that the highly creative person, as measured by tests of associative creativity, will exhibit high measures of cognitive differentiation, field-independence, and high measures of flexibility.

Statement of the Problem

The problem for this study is: Can creative ability be predicted based upon knowledge of cognitive style and flexibility? In what ways are cognitive style, creativity and flexibility interrelated? A subproblem to this is what

part does flexibility play in both creativity and cognitive style?

Purpose of the Study

The purpose of this research was to demonstrate the interrelationship of three functions: field-independent/dependent cognitive style, creativity and flexibility. It was assumed that there is some quality essential to both field-independence and creativity, and that it can be identified as flexibility. It was believed that a creative person must alternatively adopt both an analytical orientation and a global orientation. He must be able to clarify, define, and classify the elements of a problem. But he must also be able to see the whole problem and the systematic interrelations of its elements. The quality which allows for this movement is the same quality which makes possible creative combinations of diverse elements (associative creativity). It is the quality designated as flexibility. This study, in short, hypothesized that flexibility interacts in a determining fashion with both field-independence and creativity. If this is true, field-independents should be differentiated into subgroups relative to the flexibility variable. Since this is a variable common to both field-independence and creativity, it is expected that these

subgroups will also distinguish between creatives and non-creatives. It is further expected that the flexibility index will contain a significant and positive correlation between the measures of category width and figure/ground shift.

Statement of Hypotheses

Rationale for hypotheses. The theoretical connection between flexibility, field-independent cognitive style and creativity leads to the conclusion that flexibility and field-independent cognitive style are the independent variables which are most important in the prediction of creativity. It is also expected that flexibility will be unevenly distributed among subjects with some subjects rigidly fixed in their field-independent/dependent cognitive styles while others have flexibility to move in and out of their cognitive style.

Specific hypotheses. The following are the hypotheses tested in this study. The level of significance taken in this study is .05. The hypotheses are stated in both the substantive form and the statistical, null, form. Kerlinger suggested this method of hypothesis statement

> A substantive hypothesis is the usual type of hypothesis . . . in which a conjectural statement of the relation between two or more variables is expressed . . . (e.g., Mean A is greater than Mean B).

> A statistical hypothesis is a conjectural statement, in statistical terms, of statistical relations deduced from the relations of the substantive hypothesis . . . . A statistical hypothesis expresses an aspect of the original substantive hypothesis in quantitative and statistical terms. $M_A > M_B$, Mean A is greater than Mean B . . . at the .01 level . . . .[18]

Kerlinger presents the substantive hypothesis first followed by the null:

$$H_1: \quad M_A > M_B$$

$$H_0: \quad M_A = M_B$$

This form is followed in the statement of the specific hypotheses.

H_1 Field-independent cognitive style subjects will score higher on measures of flexibility than will field-dependent cognitive style subjects.

H_{01} There is no significant difference between field-independent cognitive style subjects and field-dependent cognitive style subjects on measures of flexibility.

H_2 Field-independent cognitive style subjects will score higher on creativity measures than will field-dependent cognitive style subjects.

H_{02} There is no significant difference between field-independent cognitive style subjects and field-dependent cognitive style subjects on measures of creativity.

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[18]Kerlinger, Foundations of Behavioral Research, pp. 201-202.

H_3 High flexible subjects will score higher than low flexible subjects on measures of creativity.

H_{03} There is no significant difference between high flexible and low flexible subjects on measures of creativity.

H_4 The interaction between cognitive style and flexibility will be significant in that the high-flexible/field-independent cognitive style subjects will score significantly higher on measures of creativity than the low-flexible/field-dependent subjects.

H_{04} There is no significant interaction between the degree of flexibility and the level of cognitive styles in predicting creativity.

H_5 The predictor variables of flexibility and cognitive style optimally predict the criterion variable of creativity.

H_{05} The predictor variables of flexibility and cognitive style do not optimally predict the criterion variable of creativity.

Limitations of the Study

A limitation to the study was the fact that there is no universally accepted measurement of creativity. It was assumed that the associative creativity necessary in the performance of the Wallach and Kogan tasks measures the same creativity needed in other creative activities.

Another limitation of this study was the fact that no one measure of flexibility has been found which is accepted

among researchers in this field. The theoretical assumptions about flexibility also lack consistency.

A final limitation of this study lies in the fact that all subjects were drawn from an incidental sample. Generalization of the results of the study beyond this population is therefore valid only to the extent that the population sampled is representative of the population.

Operational Definition of Terms

The following terms were used in this research:

Cognitive style: Those stable and enduring patterns of personal consistency which find expression in the ways an individual organizes and processes information and experience.

Field-independent: Subjects who scored in the upper one-half of the sample on Group Embedded Figures Test. In this study the term high cognitive style is used interchangeably with field-independence.

Field-dependent: Subjects who scored in the lower one-half of the sample on Group Embedded Figures Test. In this study the term low cognitive style is used interchangeably with field-dependence.

Flexible cognitive style: Field-independent/dependent subjects who score in the lower one-half on the

composite measures of flexibility.

Nonflexible cognitive style: Field-independent/dependent subjects who score in the lower one-half on the composite measures of flexibility.

High Creatives: Subjects who score in the upper one-half of the Wallach and Kogan Creativity Test.

Low Creatives: Subjects who score in the lower one-half of the Wallach and Kogan Creativity Test.

Flexibility: Subjects who score in the upper one-half in their composite score on measures of flexibility.

Nonflexibility: Subjects who score in the lower one-half in their composite score on measures of flexibility.

Narrow Category Width: Subjects who score in the lower one-half on the Category Width Test.

Broad Category Width: Subjects who score in the upper one-half on the Category Width Test.

High Figure/Ground Shift: Subjects who score in the upper one-half on the Necker Reversible Cube Test.

Low Figure/Ground Shift: Subjects who score in the lower one-half on the Necker Reversible Cube Test.

Significance of the Study

This study was designed to determine what relationships exist between field-independence and field-dependence and measures of flexibility and creativity. If the hypothesized relationships between these variables can be demonstrated, several inferences can be drawn. First, the combination of the variables of field-independence and flexibility can be used as a new distinction and refinement of the field-independent cognitive style. This will make it possible to think of this cognitive style in a more precise manner. Second, the field-independence-flexible variable can be used as a predictor of creativity. Third, from this knowledge a more appropriate measure of real world creativity can be developed as an alternative to the present dependence upon measure of aptitude and intelligence.

All of these benefits would result in a fourth and more important contribution. That would be the development of a better predictive mechanism to assist in the screening and selection of creative persons in both public and private organizations. It would also provide an alternative to achievement and intellective procedures for screening and selection in universities and in the professions.

CHAPTER II

REVIEW OF RELATED LITERATURE

The Nature of Cognitive Styles

The Development of the Cognitive Styles Concept

The study of individual differences took on a new perspective with the development of the concept of cognitive styles. Stylistic consistences, rather than "traits," "types," "abilities," or other dimensions, have come to the forefront in the study of psychological differences. The term "style" aptly conveys the meaning of individual preference. It consists, therefore, of those individually prefered ways of organizing one's perceptual field, of processing and storing information. Kogan's definition of cognitive styles is one of the clearest,

> Cognitive styles can be most directly defined as individual variation in modes of perceiving, remembering, and thinking, or as distinctive ways of apprehending, storing, transforming, and utilizing information.[1]

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[1]Kogan, "Educational Implications," p. 244.

This approach to individual differences has evolved over the last thirty years from laboratory studies in the psychological study of cognition.[2] There is a wide diversity of labels given to these studies of cognitive functioning. A rehearsal of these overlapping and sometimes duplicated theoretical constructs is beyond the limits of this study. Messick and Kogan provided complete descriptions of all the styles identified at this time.[3] For the purposes of this research the Witkin conceptualization was selected as a measure of cognitive style and will be discussed in this section of the review of the literature which follows.

Witkin suggested four essential characteristics of cognitive styles:

> First, cognitive styles are conceived with the form rather than the content of cognitive activity. They refer to individual differences in how, we perceive, think, solve problems, learn, relate to others, etc. The definition of cognitive styles is thus cast in process terms . . . .

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[2]Kagan and Kogan, "Individual Variation," pp. 1273-1365.

[3]S. Messick, "The Criterion Problem in the Evaluation of Instruction: Assessing Possible, Not Just Intended Outcomes," in M. C. Wittrock and D. W. Wiley (eds.), The Evaluation of Instruction: Issues and Problems (New York: Holt, Rinehart and Winston, 1970); and Messick, "Personality Consistencies."

> Second, cognitive styles are pervasive dimensions. They cut across the boundaries traditionally . . . used in compartmentalizing the human psyche and so help restore the psyche to its proper status as a holistic entity . . . .
>
> A third characteristic of cognitive styles is that they are stable over time . . . .
>
> Fourth, with regard to value judgments, cognitive styles are bipolar. This characteristic is of particular importance in distinguishing cognitive styles from intelligence and other ability dimensions. To have more of an ability is better than to have less of it. With cognitive styles, on the other hand, each pole has adaptive value under specified circumstances, and so may be judged positively in relation to those circumstances.[4]

Witkin's field-dependent/independent cognitive style will now be examined in detail.

Field-independent/dependent Cognitive Style

The cognitive style which has received the most thorough investigation during the past thirty years is without question Witkin's field-dependent/field-independent style. These studies have been applied to a wide array of psychological issues.[5] For the purposes of this study

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[4]Witkin et al., "Educational Implications," pp. 15-16.

[5]The Educational Testing Service, Princeton, New Jersey, provides an extensive bibliography with more than 2,500 entries related to field-independent/field-dependent.

field-independence appeared to be the most useful means of assessing the psychological characteristics that would be relevant to certain dimensions of creativity. It seemed reasonable that the measure of field-independence would be essential to this ability.

The early studies in field-independence measured the individual's ability to locate the upright in space or how they orient themselves with regard to sensations from within their body.[6] The two tests used to determine these individual differences were the Body-Adjustment Test (BAT) and the Rod-and-Frame Test (RFT). In the BAT the subject is seated in a chair which is projected into a small room. Both chair and room are tilted and the subject is asked to adjust the chair to any upright position. Field-independent subjects tended to align their body with the tilted room, suggesting that the surrounding field has been used as the primary referent for determining the position of the body. Field-independent subjects, on the other hand, right their chair to true upright regardless of the tilt of the room. They apparently used internal bodily sensations as primary referents. In the RFT the subject is required to adjust

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[6]Witkin, "Perception of Body Position and of the Position of the Visual Field," Psychological Monographs, 1949, 63 (1, Whole No. 302).

a luminous rod to true upright in a luminous frame while seated in a darkened room. The individual must ignore the frame which is tilted in various positions. Another technique sometimes used is the Rotating Room Test (RRT). While modifying the gravitational pull through centrifugal force, the subject must adjust his body to true upright.

In all of these tests it was apparent that some individuals (field-dependent) relied primarily on visual cues to judge uprightness while others (field-independent) used kinesthetic, or body, cues. It was later discovered that these individual differences occur also in perception. Tests were developed to measure the subjects ability to disembed an item from an organized visual field. The test was called the Embedded-Figures Test (EFT).[7] The task was to find a relatively simple geometric figure in a more complex geometrical figure. Consistently the EFT, the RFT and the BAT identified the same subjects as field-dependent and field-independent, i.e., the same individuals who had difficulty in establishing true upright had the most difficulty

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[7]For explanations of these tests see Witkin, "Individual Differences in Ease of Perception of Embedded Figures," Journal of Personality, 1950, 19, 1-15; and H. A. Witkin; P. K. Oltman; E. Raskin; and S. A. Karp, A Manual for the Embedded Figures Tests (Palo Alto, Calif.: Consulting Psychologists Press, 1971).

in finding the simple figures. Witkin et al. believed that the underlying common denominator of these individual differences was the

> extent to which the person perceives part of a field as discrete from the surrounding field as a whole, rather than embedded in the field; or the extent to which the organization of the prevailing field determines perception of its components; or, to put it in everyday terminology, the extent to which the person perceives analytically.[8]

The distinction between field-independent and field-dependent is, therefore, defined as an analytic versus a global field approach. In this analytical approach objects are experienced as discrete from their backgrounds, while in the global orientation the individual's surrounding exert a more conforming influence.

The implications of these different styles on personality have been studied and will be discussed in this section. Before pursuing this, the literature related to differentiation will be considered.

The Concept of Psychological Differentiation

The importance of differentiation theory was elaborated in the first chapter of this study. The research

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[8]Witkin et al., "Educational Implications," pp. 6-7.

literature relating differentiation and field-independence/field-dependence is rather limited although this is a fundamental concept to practically all of the research conducted by Witkin and his associates. Werner specifies organismic development from part-whole and subject-object differentiation in three levels of functioning--sensorimotor, perceptual, and conceptual--each successive level reflects greater articulation. This results in an hierarchic integration.[9] Kagan and Kogan traced the influence of Werner on Witkin's theory, especially the concept of highly and limited differentiated cognitive functioning.[10] This concept implies, therefore, developmental progression of increasing psychological differentiation from early childhood through young adulthood.

More recent studies have concerned the correlation of neurophysiological lateralization with field differentiation. Oltman and Ehrlichman tested college students on a composite score of field-independent/field-dependent measures

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[9]For an overview of Werner's theory see J. Langer, "Werner's Comparative Organismic Theory," in P. H. Mussen, (ed.), Carmichael's Manual of Child Psychology, Vol. 1, (New York: Wiley, 1970), pp. 733-772.

[10]Kagan and Kogan, "Individual Variation in Cognitive Processes," in P. H. Mussen, (ed.), Carmichael's Manual of Child Psychology, Vol. 1, (New York: Wiley, 1970), pp. 1285-1286.

and found the field-independent subjects showed greater correlation than did the field-dependents. The field-independent subjects showed greater visual-field lateralization. Therefore, it appears that greater differentiation in the field-independent subjects is supported in the fact that they also exhibited greater neural lateralization.[11] Similar findings were reported by Zoccolotti and Oltman.[12] While Messick and Damarin found field-dependent subjects superior at recognizing faces than field-independent subjects, they did not consider this a contradition of the differentiation theory.[13]

The discussion of differentiation was important to this study primarily as it related to mobility (flexibility) to shift between cognitive styles and the implications this may carry for creativity. This is discussed in more detail in the section on flexibility.

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[11]P. K. Oltman and H. Ehrlichman, "Field Independence and Laterality in the Perception of Faces," Perceptual and Motor Skills, 1977, 45, 255-260.

[12]P. Zoccolotti and P. K. Oltman, "Field Dependence and Lateralization of Verbal and Configurational Processing," Research Bulletin 76-38 (Princeton, N. J.: Educational Testing Service, 1976).

[13]S. Messick and F. Damarin, "Cognitive Styles and Memory for Faces," Journal of Abnormal and Social Psychology, 69, 3, September 1964, 313-318.

Personality Characteristics of Field-independents/dependents

Witkin established personality correlates to field-independence and dependence in the early stages of the development of his concepts. The field-dependent persons were identified as characterized by passivity in dealing with the environment. They demonstrated poor control over their impulses; lacked self-esteem; and possessed a relatively primitive, undifferentiated body image. The field-independent or analytical, on the other hand, were characterized by activity; independence in relationship to their environment; better control over their own impulses; high self-esteem and a more differentiated body image.[14]

These personality differences extend to a person's social relations as well. Field-dependent persons demonstrated greater attentiveness to their social surroundings than did field-independents. Witkin quoted extensive research indicating that field-dependent persons observed faces and verbal communications that the field-independent ignored.[15] Field-dependent persons also appeared to have

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[14]Witkin et al., "Role of the Field-Dependent and Field-Independent Cognitive Styles in Academic Evolution: A Longitudinal Study," Journal of Educational Psychology, 1977, 69, 3, 197-211.

[15]Witkin et al., "Educational Implications," pp. 10-11.

greater interpersonal skills in getting along with others.[16] Witkin cited the research of Crutchfield and others who reported field-independent people as being not socially sensitive, cold and distant, and interested in the abstract and theoretical rather than the interpersonal.[17]

Stability of Field-independence/ dependence

Developmental movement with age toward greater differentiation (field-independence) is well supported in the literature. This age-related change shows marked increase in field-independence between ages 8 to about 15 years. At about age 15 the developmental curves level off through young adulthood and show absolute stability until about the late 30's after which time the rate of change toward greater field dependence accelerates.[18] There is some evidence that geriatric groups move back

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[16]Oltman et al., "Psychological Differentiation as a Factor in Conflict Resolution," Journal of Personality and Social Psychology, 1975, 32, 730-736.

[17]Witkin et al., "Educational Implications," p. 13.

[18]Witkin et al., Embedded Figures Tests, p. 506; see also Witkin et al., "Stability of Cognitive Style from Childhood to Young Adulthood," Journal of Personality and Social Psychology, 1967, 7, 291-300.

towards field-dependence.[19] This age-related change is explained by Witkin et al. in a review of longitudinal studies they have conducted,

> During the growth years, an individual's standing on the field-dependence dimension shows marked relative stability--i.e., test-retest correlations for measures of field-dependence tend to be very high. Another way of expressing this relative stability is to say that children tend to hold the same position relative to their age peers on the field-dependence dimension as they grow up, while as a group they show movement toward greater field-independence.[20]

In their most recently completed longitudinal study, Witkin et al. followed a group almost 1,600 male and female college students from college entry into graduate/professional school. They found stability of cognitive styles to such an extent that when choice of college major was incongruent with the subjects' cognitive style, the student tended to shift toward a more compatible major by the time of college graduation or graduate school entry.[21]

In a longitudinal study of elementary school

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[19]For a review of the research relevant to the aged and cognitive styles see P. E. Comalli, "Life-Span Changes in Visual Perception," in Life-Span Developmental Psychology: Research and Theory, L. R. Goulet and P. B. Baltes, eds. (New York: Academic Press, 1970).

[20]Witkin et al., Embedded Figures Tests, pp. 5-6.

[21]Witkin et al., pp. 197-211.

children tested over a four year period, Neimark found field-independence/dependence relatively constant among her subjects as they showed indications of passage through the Piagetian developmental stages. Neimark concluded,

> Thus, it appears that field-independence as reflected in ability to isolate a simple form from a complex, embedding context on the EFT is a relevant contributory factor in the development of the abstract level of formal operations thought.[22]

Lawson's study of sixth grade students supported the view of Neimark. Using the Group Embedded Figures Test Lawson found that a degree of field-independence is necessary for development of formal stage reasoning.[23] These and similar studies raise the question of the modifiability of cognitive styles. This aspect of cognitive styles is important to the present study because it hypothesizes a flexibility within cognitive styles. As will be seen, however, in the discussion of flexibility, the concept of flexibility assumes stability of cognitive style but theorizes that there is a category of cognitive style which must be

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[22] E. D. Neimark, "Longitudinal Development of Formal Operations Thought," Genetic Psychology Monographs, 1975, 91, 171-225.

[23] A. E. Lawson, "Formal Operations and Field Independence in a Heterogeneous Sample," Perceptual Motor Skills, 1976, 42, 981-983.

classified as flexible. The existence of such a style would obviously be open to serious question if stability is lacking in the field-independent/field-dependent cognitive styles.

Earlier discussions in this study indicated the depth to which cognitive styles have been associated with personality characteristics and perceptual processes. Studies have shown these factors resistent to training.[24] Reduction of field-dependence on the RFT has been achieved by Wolf[25] through experiences of body rotation and by Jacobson[26] through sensory deprivation.

Botkin made an innovative alteration to the Witkin testing procedures to induce changes in individual's cognitive styles. She modified the Body Adjustment Test using a prolonged viewing or normalization technique to encourage shifts to more field-dependent functioning. Similarly the Rod and Frame Test was altered so that subjects were first given relaxation-merging instructions to induce a

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[24]R. B. Dyk and H. A. Witkin, "Family Experiences Related to the Development of Differentiation in Children," Child Development, 1965, 36, 21-55.

[25]A. Wolf, "Body Rotation and the Stability of Field Dependence," Journal of Psychology, 1965, 59, 211-217.

[26]G. R. Jacobson, "Effect of Brief Sensory Deprivation on Field Dependence," Journal of Abnormal Psychology, 1966, 71, 115-118.

de-differentiation of body and field. These procedures were successful in temporarily altering cognitive style.[27]

The results of the above mentioned studies leave unaltered the previous position that cognitive styles, although temporarily modifiable, are stable over time. The most recent experiments of the Witkin group may produce evidence that could change this conclusion. There are presently attempts being made to train field-independents to become more field-dependent with respect to their social and interpersonal relations.[28]

Sex Differences in Field-Independence/Dependence

Sex related differences have been consistently found in the research.[29] Males were found to be more field-independent than females among older children and young adults while sex differences may not be present before the age of eight or in geriatric groups, these differences are

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[27]E. B. Botkin, "Fixity-Mobility: Its Relationships to Field Independence and Rigidity" (Unpublished doctoral dissertation, Yeshiva University, 1973).

[28]Personal communication with P. K. Oltman, Educational Testing Service, Princeton, N. J., February 15, 1978.

[29]Witkin et al., Personality through Perception; and Witkin et al., "Stability."

definitely found in later studies.[30] Are these differences linked to physiological and hormonal factors or to cultural practices? This is the current debate among researchers. Kogan concluded from his survey of the literature that while the within (same-sex) group differences are greater than the between (different sex) groups, in the real world of careers women are greatly underrepresented in the occupations requiring analytic cognitive style. This, Kogan said, can only be attributed to differential cultural practices.[31]

Vocational and Career Choices of Field-Independents/Field-Dependents

Considering the field-dependent person's social awareness and responsiveness to his environment, it is not surprising to find that they consistently favor educational and vocational areas in which involvement with others is a central feature. Field-independents, on the other hand, favor choices that are more solitary and abstract. It must be pointed out, however, that field-dependence/field-independence shows non-significant correlation to college grade-point average.[32]

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[30]Witkin et al., "Educational Implications."

[31]Kogan, "Sex Differences," pp. 114-115.

[32]Witkin et al., "Educational Implications," p. 38.

The results of the previously mentioned study of about 1600 college students supported the hypothesis that there is a strong and consistent relationship between cognitive style and educational-vocational preference. Witkin et al. summarized their findings concerning congruence,

> The tendency of students to gravitate toward educational-vocational domains congenial to their cognitive styles was manifested in another way. Students whose preliminary major choices at college entry were compatible with their cognitive style were likely to remain with those majors through college and into graduate school. Students who made incomplete preliminary choices tended to shift to more compatible domains in the course of their time in college.[33]

The responses of field-independent students on standard interest inventories have consistently indicated preferences for the mathematics and scientific occupations such as mathematician, physicist, chemist, biologist, architect and engineer. In contrast to this the field-dependent students' preference were in the occupational areas of interpersonal relations as social worker, minister, rehabilitation counselor, teacher of social science.[34]

An interesting conclusion drawn by Witkin et al. was that both field-dependent and field-independent may desire

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[33]Witkin et al., "Academic Evolution," p. 208.

[34]Witkin et al., "Educational Implications," pp. 40-41.

and assume leadership positions. Field-independent persons indicated interest in practical jobs such as production managers and the teaching of technical subjects. In the later case both analytical ability was necessary with regards to the subject matter and interpersonal skill was necessary for teaching. Field-dependent persons, similarly, expressed interest in administrative activities.[35] The practical consequence of this interaction of cognitive style preference and occupational demands is easily apparent--the teacher of social sciences who becomes a principal, the rehabilitation counselor who takes an administrative position, the engineer promoted to management and the scientist directing a research team.

Flexibility in Cognitive Style and Creativity

Flexibility of cognitive functioning has been studied in a number of different contexts. Chown provided an extensive review of theory and research related to the general concept of flexibility.[36] In his studies concerning the effects of age on rigidity, Schaie derived three factors

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[35] Ibid., p. 41.

[36] S. Chown, "Rigidity--A Flexible Concept," Psychological Bulletin, 1959, 56, 195-223.

to describe this concept. They were: 1) motor-cognitive rigidity; 2) personality-perceptual rigidity; and 3) psycho-motor speed. Motor-cognitive rigidity is concerned with the ability to shift without difficulty from one activity to another. Personality-perceptual rigidity assesses the ability to adjust readily to new cognitive patterns. The psycho-motor speed factor indicates ability for rapid cognitive responses in familiar situations.[37] Adorno's[38] authoritarian rigidity and Rokeach's[39] closemindedness represent personality theories of flexibility. These concepts, along with previously mentioned concepts of flexibility, suggest the breath and diversity of theoretical and research findings which attempt to define flexibility.

Research in flexibility of specific relevance to this study are those related to (1) shift in field-independent/field-dependent cognitive styles, and (2) flexibility

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[37]K. W. Schaie, "Rigidity--Flexibility and Intelligence: A Cross-Sectional Study of the Adult Life-Span from 20-70 Years," Psychological Monographs: General and Applied, 1958, 72, 9 (Whole No. 462), 1-26.

[38]T. W. Adorno et al., The Authoritarian Personality (New York: Harper and Row, 1950.

[39]M. Rokeach, The Open and Closed Mind (New York: Basic Books, 1960).

directly related to creativity. Flexibility and cognitive style will be considered first.

Flexibility and Cognitive Style

Fixity versus mobility of cognitive functioning is a concept that has received little clarification within field-independent/dependent research. Regularity of cognitive style has suggested that all persons are "fixed" in their cognitive style of operation, either field-independent or field-dependent. From a theoretical viewpoint, however, it was clearly the intention of both Werner[40] and Witkin[41] that flexibility of cognitive functioning be recognized as a possibility. The differentiation theory mentioned in Chapter I of this research sees field-independence as a more highly developed form of cognitive functioning than field-dependence. However, both Werner and Witkin described "mobility," the ability to function at different developmental levels, as the highest stage of cognitive development.

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[40]H. Werner, "The Concept of Development from a Comparative and Organismic Point of View," in D. B. Harris, ed. The Concept of Development: An Issue in the Study of Human Behavior (Minneapolis: University of Minnesota Press, 1957).

[41]H. A. Witkin, "Psychological Differentiation and Forms of Pathology," Journal of Abnormal Psychology, 1965, 70, 317-336; and Witkin et al., Embedded Figures Tests, p. 11.

The issue of flexibility is considered within the context of the broader theory of developmental differentiation. In an excellent review of this theory Haronian and Sugerman discussed the historical background of differential theory.[42] Witkin, following Werner's theory of differentiation, stated that the greater the degree of differentiation within the person, the more elaborate is that person's experience of this world and the more complex are his relationships with it. There is a development toward greater psychological complexity as the individual grows older. It is a movement from a global to an analytical mode of operation. The field-independent person represents a more highly differentiated cognitive functioning than the field-dependent.

Werner described all organisms as having an intrinsic trend toward differentiation which stabilizes in specialized reaction patterns. This process Werner called fixity. If it continues, he said, it will "finally lead to rigidity of behavior if not counterbalanced by the polar principle of mobility. Mobility for Werner is that condition of:

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[42]F. Haronian and A. A. Sugerman, "Field Independence and Resistence to Reversal of Perspective," Perceptual and Motor Skills, 1966, 22, 543-546.

> . . . stability of structures and operations in the functioning of the organism which occurs as the organism reaches higher levels of differentiation. This can be accomplished, however, only through a process of partial return to a genetically earlier, less stable level, that is, one has to regress in order to progress.[43]

Witkin's theory is an elaboration of Werner's. Some persons are regarded as "fixed" in their form of functioning while others are "mobile." For Witkin

> Mobility can be a characteristic of highly differentiated person only, i.e., of persons who have available to them both a developmentally advanced mode of functioning (field-independent) and a developmentally earlier mode (field-dependent). Shifting of levels, implied by mobility, is thus not a possible feature of field-dependent persons.[44]

The means by which flexibility is possible, Witkin and Goodenough called "restructuring ability."[45] This ability is diminished in field-dependent persons due to their lack of internal referents and their lesser self-nonself segregation. Witkin and Goodenough stated:

> We can thus see that the limited self-nonself segregation of field-dependent people stimulates the development of social sensitivity and social skills while at the same time limiting the development of restructuring skills. The greater self-nonself segregation of field-independent people

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[43]Werner, "Concept of Development," pp. 138-139.

[44]Witkin et al., Embedded Figures Tests, p. 11.

[45]Witkin and Goodenough, "Field Dependence Revisited," pp. 49-53.

> contributes to the development of cognitive restructuring skills, and does not especially encourage the development of social sensitivity and social skills.[46]

Accordingly such mobile persons, Witkin believed, have the choice of being attentive or inattentive to social cues; close or emotionally distant to others; restructure a given field or go along with it as given.[47]

Witkin's earlier studies of cognitive style and pathology supported this conclusion that certain personalities are "fixed" and, therefore, resistent to personality changes through therapy. Some field-independent subjects were fixed in their style while others varied more according to circumstances and inner state.[48] Witkin supported these findings with a study by Perez in which subjects were induced to shift between analytic and global approaches on a size contancy task. Field-dependents were less able to make this adjustment than were field-independents.[49]

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[46]Witkin and Goodenough, "Field Dependence Revisited," p. 50.

[47]Ibid., pp. 51-52.

[48]Witkin, "Pathology," pp. 317-336.

[49]P. Perez, "Experimental Instructions and Stimulus Content as Variables in the Size Constancy Perception of Schizophrenics and Normals" (Unpublished doctoral dissertation, New York University, 1955).

Botkin reviewed several studies which offer evidence to support the hypothesis that field-independents may differ along other important psychological dimensions including masculinity-femininity and defense mechanisms.[50] Botkin's own study found support for mobility between differentiated functioning of cognitive styles as measured by altered forms of the Body Adjustment Test and the Rod and Frame Test. Her study also found significant correlation between mobile subjects and flexibility on a problem-solving test of rigidity.[51] This is supported in a study by Davis and Haneisen in which field-independent college students were found to be more proficient hypothesis-testers than field-dependent students in the solution of learning set problems.[52]

Haronian and Sugerman, using the Necker cube, found field-independent persons possess both fixity and mobility while field-dependents do not. Field-independence does not automatically mean there is an ability to switch from global

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[50]Botkin, "Fixity-Mobility," pp. 5-7.

[51]Ibid., pp. 1-79.

[52]J. K. Davis and W. C. Haneisen, "Field Independence and Hypothesis Testing," Perceptual and Motor Skills, 1976, 43, 763-769.

to analytical.[53] Earlier studies by Newbigging[54] and Jackson[55] using the Necker cube confirmed the Witkin hypothesis of mobility differences among field-independent subjects. Eisner, using the Stroop Color Word Test, tested field-independence and fixity-mobility across age range and discovered significant age differences. The young and old age groups were relatively less field-independent than the high school, college and middle-age groups.[56]

Eisner criticizes the Haronian and Sugerman and Bloomberg studies on the ground that their subjects were restricted to 19 year olds who Eisner demonstrated belong to a dominant field-independent population. (This could also apply to Botkin.) This age range, therefore, does not represent an adequate range of field-independent/field-dependent subjects. Eisner's own study concluded

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[53]Haronian and Sugerman, "Fixed and Mobile Field Independence: Review of Studies Relevant to Werner's Dimension," Psychological Report, 1967, 21, 41-57.

[54]P. L. Newbigging, "The Relationship Between Reversible Perspective and Embedded Figures," Canadian Journal of Psychology, 1954, 8, 204-208.

[55]D. N. Jackson, "Stability in Resistance to Field Forces" (Unpublished doctoral dissertation, Purdue University, 1955).

[56]D. A. Eisner, "Developmental Relationships Between Field Independence and Fixity-Mobility," Perceptual and Motor Skills, 1972, 34, 767-770.

that with an increase in the levels of field-independence, there is a tendency for persons to be mobile in response to situational demands and that with a decrease in the level of field-independence there is a tendency toward fixity of response. A significant shortcoming of earlier studies of flexibility (Bloomberg, Botkin, Haronian and Sugerman), has been their inadequate clarification and measurement of flexibility.

There has also been a serious question raised regarding the whole concept of analytical processes and the degree to which Witkin's testing approach actually allows the subjects freedom of preference. In a comparative study of Witkin's Embedded Figures Test and Kagan's design variation and object sorting tasks, Wachtel found that subjects showing predominantly "analytic" sorts on the Kagan task were no more likely to be "analytic" on the EFT or design variations than were subjects showing any other preference in conceptual grouping. Wachtel points out that whereas the EFT and the design variations required the subjects to be analytical, and therefore measured capacity, the sorting task left the subjects free to choose their

mode of categorizing and hence did not measure capacity, but a stylistic preference.[57]

Flexibility and Creativity

The concept of flexibility has almost universally been considered crucial to creativity. However, there is no more agreement about flexibility in creativity than there is in the study of cognitive style. Kris, using a psychoanalytical approach, speaks of regression in the service of the ego. This is the ability to regress from secondary processes to more primitive stages. Kris' theory was that the healthy ego can regulate occasional regression, i.e., a temporary withdrawal of ego control, as part of the ego's integrative function.[58] This is quite similar to the already cited expression of Werner: "One has to regress in order to progress." This ability to regress is seen by Kris as an integral part of the creative process. Along this same line Gamble and Kellner[59] and

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[57]P. L. Wachtel, "Style and Capacity in Analytical Functioning," Journal of Personality, 1968, 36, 202-212.

[58]E. Kris, "On Preconscious Mental Processes," Psychoanalytic Quarterly, 1950, 19, 540-560.

[59]K. R. Gamble, and H. Kellner, "Creative Functioning and Cognitive Regression," Journal of Personality and Social Psychology, 1968, 9, 266-271.

Hersch[60] have studied cognitive regression and support Kris' thesis. They indicated that creative persons are superior to low creative individuals in the ability to shift to a developmentally early mode of functioning.

Olesker's recent research lends support to this position. He hypothesized that persons capable of flexible concept formation will exhibit higher physiognomic perception. It was assumed in his study that,

> If a person is able to call upon a more primitive level of perception, while still being able to function on an abstract, highly differentiated level, he should have a wider range of experience available when called upon to see things in a variety of different ways.[61]

Olesker's hypothesis was supported by the data.

Flexibility in creativity has also been studied in terms of attention deployment, or span of information processing. Flexibility as breadth of attention deployment is demonstrated in spontaneous fantasy and daydreaming where cognitive activity is task-irrelevant. In this context creativity is designated as that ability to assimilate

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[60]C. Hersch, "The Cognitive Functioning of the Creative Person: A Developmental Analysis," Journal of Projective Techniques, 1962, 26, 193-200.

[61]W. Olesker, "Physiognomic Perception and Flexibility of Concept Formation," Perception and Motor Skills, 1977, 45, 99-100.

information acquired in one context and apply it adaptively in a quite different context. This could also be used as the definition for attention deployment.[62] In like manner, Santostefano and Paley discussed a style designated "extensiveness of attention deployment."[63] Botwinick has reviewed the studies on attentional mechanisms used in the assimilation of information that subjects have not been instructed to learn.[64] This "incidental learning" is quite similar to the above mentioned studies. Wallach and Kogan distinguished between categorizing and conceptualizing as they relate to creativity. The former is preference for narrow versus broad categories and the latter is a matter of the structural and content characteristics of concepts employed when grouping diverse stimuli. Conceptualization was measured in terms of "descriptive," "thematic," and "relational." These are developmentally related, moving from mere descriptive capability at the lowest extreme to relational at the highest. Wallach and Kogan concluded that high-creative thinkers

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[62]Wallach, "Creativity," pp. 1211-1272.

[63]S. G. Santastefano and E. Paley, "Development of Cognitive Controls in Children," Child Development, 1964, 35, 939-949.

[64]J. Botwinick, "Learning in Children and in Older Adults," in L. R. Goulet and P. B. Baltes, eds., Life-Span Developmental Psychology: Research and Theory (New York: Academic Press, 1970).

exhibited a broader categorization than low creative. They suggested this represents a tolerance in creatives for divergent instances, wider acceptance limits for assigning instances to a given class. High creativity in the conceptualization measures was related to balanced usage of thematic conceptualizing styles. Thematic grouping was done by identifying a common element shared by all objects, while in the relational grouping all the objects contributed to the group conceptualization. Their findings that the high creative subjects were able to change between the two bases for sorting indicates again the importance of flexibility. The other subjects were inflexible.[65]

Bloomberg's interpretation of Wallach and Kogan studies saw the flexibility in conceptualization modes as similar to both field-independent/dependent flexibility and the quality of novelty association found in creativity. Bloomberg suggested that categorizing breadth implies some quality of flexibility of thought that will permit the individual the freedom to stretch category boundaries to

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[65]Wallach and Kogan, Modes of Thinking.

[66]M. Bloomberg, "An Inquiry into the Relationship Between Field-Independence-Dependence and Creativity," Journal of Psychology, 1967, 67, 124-140.

accomodate instances remote from the central tendency value.[66]

Wallach,[67] based on Mendelsohn's and Griswold's[68] and Laughlin's[69] study of incidental cue utilization, suggested "breadth of attention deployment," and fantasy (or daydreaming) as necessary to success on creativity tasks. This attention deployment mechanism that permits the individual's mind to wander from the focal stimulus to incidental cues additionally appears to be some form of flexibility in thinking.

Although there is apparent overlap between all of these forms of information assimilation, there is no research to indicate their interrelationships or their joint relationship to field-independent cognitive style and creativity.

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[67]Wallach, "Creativity," pp. 1248-1249.

[68]G. A. Mendelson, and B. B. Griswold, "Differential Use of Incidental Stimuli in Problem Solving as a Function of Creativity," Journal of Abnormal and Social Psychology, 1964, 68, 431-436; and Mendelsohn and Griswold, "Assessed Creativity Potential, Vocabulary Level, and Sex as Predictors of the Use of Incidental Cues in Verbal Problem Solving," Journal of Personality and Social Psychology, 1966, 4, 4, 423-431.

[69]P. R. Laughlin, "Incidental Concept Formation as a Function of Creativity and Intelligence," Journal of Personality and Social Psychology, 1967, 5, 115-119.

Breadth of Categorization, Cognitive Style and Creativity

A summary review of the different measures and concepts related to category width is provided by Kagan and Kogan.[70] The studies of Wallach and Kogan cited earlier suggested the importance of a broad rather than narrow categorization preference to creativity. At the time of the Wallach and Kogan studies they stated that there had been no empirical attempt to relate conceptual band width to creativity. The rationale of such a connection, however, seemed apparent to Wallach and Kogan.

> Persons willing to entertain the possibility that highly deviant instances deserve category membership might well turn out to be most capable of conceiving of manifold and unusual possibilities in connection with the creativity tasks . . . .[71]

Messick defined category dimensions as differential tolerances for different types of errors. Broad categorizers tolerate errors of inclusion and narrow categorizers tolerate errors of exclusion. Messick concluded from the research that, "The narrow categorizer is thought to be conceptually conservative, whereas the broad categorizer

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[70]Kagan and Kogan, "Individual Variation," pp. 1282-1284.

[71]Wallach and Kogan, Modes of Thinking, p. 95.

is thought to be more tolerant of deviant instances.[72]

Contrary to the above mentioned findings of Messick, and the conceptual assumptions that broad categorizers take greater risks than narrow categorizers, Kogan and Wallach found data on female undergraduate subjects directly counter to these conceptions and findings. They found greater category breadth in females, as measured on the Pettigrew Category Width Test, significantly associated with conservatism in decision-making tasks (correlation coefficients of .26 ($p < .01$) and .24 ($p < .05$). However, they also reported an inverse relationship between category breadth and measures of confidence exhibited in the decisions made ($r=.25$, p .01). Kogan and Wallach assumed from this that the female subjects see narrow categorization entailing greater risks when confronting ambiguity and uncertainty.[73]

Messick and Kogan studied the influence of category width questionnaire format in assessing an individual's category score. They concluded that the broad categorizer has an advantage over the narrow categorizer when the

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[72]Messick, "Personality Consistencies," p. 15.

[73]Kogan and Wallach, Risk Taking: A Study in Cognition and Personality (New York: Holt, Rinehart and Winston, 1964), pp. 146-147.

instrument employed moderately- to widely-spaced alternatives.[74]

In concept-attainment problems, where the subject attempts to distinguish between exemplars and nonexemplars of a class, the subjects are forced to form hypotheses about class concepts. In such tests Kirschenbaum found that field-dependent subjects adopted hypotheses which favored certain cues and ignored others even though all cues had equal objective validity over the set of problems used. In contrast, field-independent subjects searched more fully the cues available. The conclusion of that study was that field-dependent subjects were dominated by the salient attributes of the stimulus in relation to its field and tended to ignore the nonsalient cues.[75] These findings were confirmed by Camillus[76]

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[74]Messick and Kogan, "Category Width and Quantitative Aptitude," Perceptual and Motor Skills, 1965, 20, 493-497.

[75]J. Kirschenbaum, "Analytic-Global Cognitive Style and Concept Attainment Strategies" (Doctoral dissertation, Claremont Graduate School, 1968).

[76]M. J. H. Camillus, "An Investigation of the Relationships among Field-Dependent/Field-Independence, Sex, and Concept-Identification Strategy" (Doctoral dissertation, University of Pittsburgh, 1972), Dissertation Abstracts International, 1973, 33, 3931B.

and Shapson.[77] A recent review of these studies and an extensive survey of the literature is found in Goodenough's study.[78]

Kogan found several significant correlates to categorizational preference. Young adult males preferred broader categories than women, and broad categorizing was associated with higher mathematical ability.[79]

Wallach's conclusion from examination of categorizing experiments was that the psychological process underlying a person's disposition toward broad categories was the same process necessary for productivity and uniqueness of associates. It was found that the process whereby the person must move outward from the most frequently encountered exemplars of a class to those that would be met only rarely is quite similar to the process of moving beyond the common associates of a stimulus to the generation of

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[77]S. M. Shapson, "Hypothesis Testing and Cognitive Style in Children" (Unpublished doctoral dissertation, York University, 1973).

[78]D. R. Goodenough, "The Role of Individual Differences in Field Dependence as a Factor in Learning and Memory," Psychological Bulletin, 1976, Vol. 83, No. 4, 675-694.

[79]N. Kogan, "Masculine and Feminine," in S. Messick and Associates Individuality in Learning (San Francisco: Jossey-Bass Publisher, 1976).

ideas which bear a more deviant relationship to the beginning stimulus.[80]

The Concept of Creativity

An Overview of Creativity Studies

Many of the studies on creativity have already been mentioned in earlier sections of this literature review and in Chapter I. A more systematic, rather than topical, approach to the creativity literature is taken in this section.

The vastness of the literature in the area of creativity is overwhelming. Wallach's extensive review of the literature examined the experimental research primarily related to the intellective processes of creativity.[81] Golann's review also looked at the psychological processes of creativity.[82] Nicholls provided a search of the literature relevant to a trait concept of creativity.[83] A more

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[80]Wallach, "Creativity," p. 1253.

[81]Ibid., pp. 1211-1272.

[82]S. E. Golann, "Psychological Study of Creativity," Psychological Bulletin, 1963, Vol. 60, No. 6, 548-565.

[83]J. G. Nicholls, "Creativity in the Person who will Never Produce Anything Original and Useful: The Concept of Creativity as a Normally Distributed Trait," American Psychologist, 1972, 27, 717-727.

general review by Taylor examined the literature associated with the creative person and the creative product.[84]

Indicators and dimensions of the creative process have been studied in terms of problem-solving ability by Davis[85] and Wallas,[86] convergent/divergent thinking processes by Guilford;[87] problem awareness and hypothesis testing by Torrance;[88] number, novelty, and variety of responses to problem situations by Getzels and Jackson;[89] associative uniqueness by Maltzman;[90] attention deployment by S. A.

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[84]I. A. Taylor, "A Retrospective View of Creativity Investigation," in Perspectives in Creativity (eds) I. A. Taylor and J. W. Getzels (Chicago: Aldine Publishing Co., 1975).

[85]Gary A. Davis, Psychology of Problem Solving: Theory and Practice (New York: Basic Books, Inc., Publishers, 1973).

[86]G. Wallas, The Art of Thought (New York: Harcourt, Brace and World, 1926).

[87]J. P. Guilford, "Creative Abilities in the Arts," Psychological Review, 1957, 64, 110-118; and Guilford, The Nature of Human Intelligence (New York: McGraw-Hill, 1967.

[88]E. P. Torrance, "Factors Affecting Creative Thinking in Children: An Interim Research Report," Merrill-Palmer Quarterly, 1961, 7, 171-180.

[89]J. W. Getzels, and P. W. Jackson, Creativity and Intelligence: Explorations with Gifted Children (New York: Wiley, 1962).

[90]I. Maltzman et al., "Experimental Studies in the Training of Originality," Psychological Monographs, 1960, 74, No. 6 (Whole No. 493).

Mednick;[91] and cognitive playfulness by Wallach and Kogan.[92] The list could go on into the psychoanalytical and psycholinguistic approaches to creativity studied by Arieti[93] and Watzlawick et al.[94]

There is no universally agreed upon behavior or ability by which creativity can be described. Wallach stated that only one quality emerges with any consistent independence from general ability or intelligence and that was "associative uniqueness."[95] It is the development of the research around this concept that is discussed in this chapter. However, the review of the literature provided no single isolated ingredient which was clearly indicative of creativity. This raised the further question of what was the cognitive or perceptual skill or ability that underlied creativity? It was at this point that the study of cognitive styles appeared to intersect the flow of

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[91]Mednick, "Associative Basis."

[92]Wallach and Kogan, Modes of Thinking.

[93]S. Arieti, Creativity: The Magic Synthesis (New York: Basic Books, Inc., Publishers, 1976).

[94]P. Watzlawick et al., Change: Principles of Problem Formation and Problem Resolution (New York: W. W. Norton and Company, Inc., 1974).

[95]Wallach, "Creativity."

creativity research. Some indications were found that certain cognitive styles and perceptual abilities are consistently associated with creative ability.

For the purposes of this study it was decided to limit the exploration of the literature to those categories of creativity most relevant to the Wallach and Kogan concept of creativity. A review of the related research follows.

Creativity Studies Related to Cognitive Functioning

Relative to the enormous amounts of general literature and research on creativity in general, there is a sparsity of studies of direct importance to the author's present study.

Using the Embedded Figures Test to measure cognitive style and four parts of the Torrance Creativity Test, Spotts and Mackler[96] tested male college students. The results indicated that individuals displaying the field-independent style were consistently more creative than those with the field-dependent style. Brennan cites a study by White which found significant relationships between body awareness, as measured by Witkin's Draw-A-Person Test, and

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[96]Spotts and Mackler, "Relationships," pp. 239-268.

motor creativity.[97] Another study using the Group Embedded Figures Test with college student subjects was conducted by Noppe and Gallagher.[98] Their measure of creativity was the Remote Associates Test. They found field-independent subjects to be significantly more creative than field-dependents. Their research also included an analysis of the subjects' strategy levels in approaching the tests. It was discovered that not only was field-independence important to creativity but in addition to this the high creatives also used systematic and organized methods in their approach to the problems.

Two studies that question the association of field-independent and creativity were conducted by MacKinnon and by Brennan. MacKinnon's studies of professionals recognized for their creative contributions presented contrasting meanings to the study of cognitive style influences. MacKinnon found practicing architects to be

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[97]M. A. Brennan, "An Investigation into the Relationship Between Creative Ability in Dance, Field Independence-Dependence, and Creativity" (Unpublished doctoral dissertation, University of Wisconsin-Madison, 1976).

[98]Noppe and Gallagher, "Creative Thought," pp. 85-90.

markedly field-independent, however, writers were field-dependent.[99]

Brennan detected no meaningful relationships between creative ability in dance, field-independence/dependence, and creativity scores among sixty-one female college dance majors. The study hypothesized there would be a positive relationship between creativity and field-independence. The hypothesis was not supported in the findings.[100]

The results of neither of these studies can be accepted without question. The MacKinnon studies used peer judgments to determine creativity. The criteria for such judgments are subject to interpretation and provided only a list of general personal traits supposed to describe the creative person. Brennan's study suffered from the fact that the Guilford tests of creativity were used to measure creativity. Wallach points out that those instruments, except for ideational fluence, have been shown to correlate significantly with general intelligence and

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[99]D. W. MacKinnon, "The Personality Correlates of Creativity: A Study of American Architects," in G. Nielson ed., Proceedings of the XIV International Congress of Applied Psychology, Vol. 2, Personality Research (Copenhagen, Denmark: Munksgaard, 1962); and MacKinnon, "Creative Potential," pp. 273-281.

[100]M. A. Brennan, "Creative Ability in Dance."

therefore, an unreliable measure of creativity.[101]

There have been few attempts to examine interacting variables in the study of cognitive styles and creativity. Bloomberg's study predicted that field-independence would interact with mobility in a creative person. Bloomberg's results did not confirm his predictions. Creativity has not found to be significantly related to field-independence nor did mobility show an interaction effect with field-independence in the prediction of creativity.[102] In a study by Del Gaudio it was hypothesized that an interaction effect, namely, that subjects scoring high on both measures of psychological differentiation and mobility, would obtain the highest creativity scores, while those scoring low on differentiation and mobility would be lowest. This interaction hypothesis was not supported. However, the data revealed a significant main effect for differentiated cognitive style. Mobility was also found to be significantly related to creativity measures.[103]

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[101]Wallach, "Creativity," p. 1223.

[102]Bloomberg, "Creativity," pp. 3-12.

[103]Del Gaudio, "Psychological Differentiation," pp. 831-841.

The Associative Concept of Creativity

Creativity has emerged through research as a separate domain from general intellectual ability. The studies by Guilford first attempted this separation by making the distinction between convergent-thinking and divergent-thinking.[104] Wallach and Kogan advanced the study of creativity with the isolation of the ideational fluency measures within the divergent-thinking domain as the indicators that are independent of conventional intelligence measures.[105] Ideational fluency is the ability to generate associative responses to a given stimulus, such as naming as many uses as possible for a familiar object. This ability is thought by Wallach to be dependent upon an underlying construct of breadth of attention deployment.[106] This is the ability to scan and retrieve remote, though appropriate, information for use in new contexts. What follows is a review of the important research which lead to this definition.

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[104]Guilford, Human Intelligence.

[105]Wallach and Kogan, Modes of Thinking.

[106]Wallach, "Creativity."

Mednick explained the basic meaning of associative creativity as the process of forming associative elements into new combinations which are useful.[107] The more remote the elements of the new combination, the more creative are the associations. The organization of a person's associations, therefore, will influence the probability and speed of attainment of a creative solution. He postulated two ways in which associative strength is distributed within the individual. He called this the associative hierarcy, or gradient. The individual's associative gradient may be "steep" or "flat." This is depicted in Figure 2.

A steep gradient suggests an individual who tends to be restricted to stereotyped responses. After mentioning one or two conventional responses to a stimulus, the individual's associative strengths to other words or ideas drops rapidly. The second type of associative gradient is flat in slope. That is, the individual's responses are not dominated by the more stereotyped possibilities. He is able to expand his thinking to the less probable, more remote associations. Based on this theoretical hierarchy Mednick hypothesized that the high creative subject (flat gradient) would respond relatively slowly and steadily and emit many responses

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[107]S. A. Mednick, "Associative Basis," pp. 583-596.

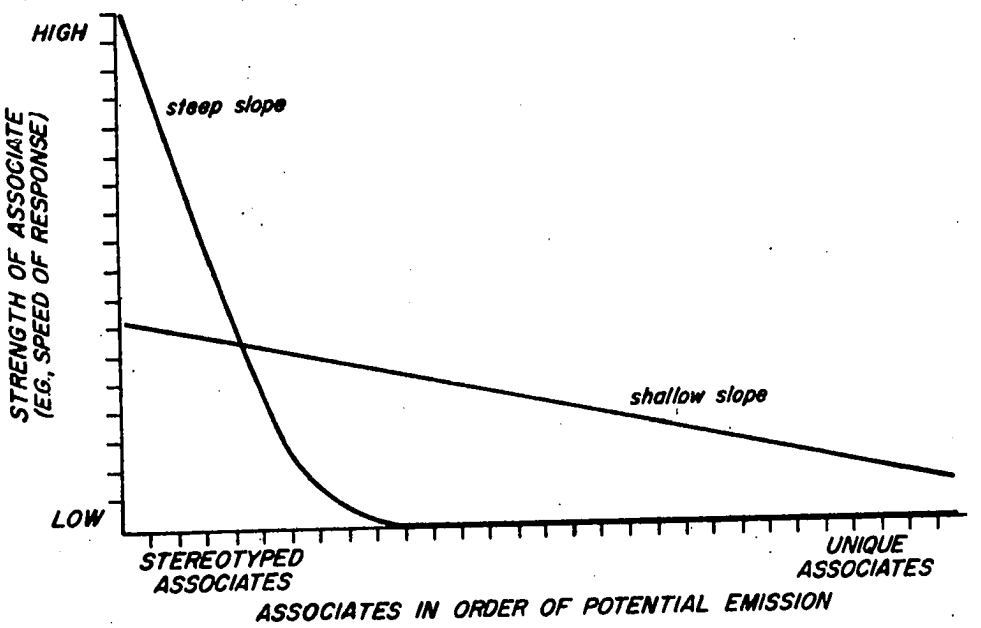


Figure 2. Mednick's Hypothetical gradients of associative strength for the Responses to a Stimulus Word.

SOURCE: Wallach and Kogan, Modes of Thinking in Young Children, p. 16.

while the low creative subject (steep hierarchy) would respond at a higher rate but emit fewer responses. Mednick found support for this hypothesis in a study of research scientists rated for creativity and divided into high and low creative groups. As predicted the low creatives gave more stereotyped responses on 80% of a group of test words.[108]

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[108]Ibid., p. 586.

Based upon this and later research Mednick developed the Remote Associates Test (RAT).

In a study of 600 high school juniors Walker[109] compared scores on the RAT to students' variance on subject grades and found that boys with high RAT scores tended to have greater variability from grade to grade. The conclusion might be that the highs were influenced more by interest and did not invest their effort uniformly. They might have been more distractible on the basis of stimuli from the environment. Following this hypothesis, a number of studies were developed to examine what came to be called "breadth of attention deployment."

Mendelsohn and Griswold[110] tested 108 undergraduates using the RAT. The subjects were given the task of memorizing a list of words while being exposed to peripheral stimuli consisting of a tape recorder playing a list of words and through working an anagram task. Both the recorded words and the anagram task contained words in the list to be memorized. High RAT subjects showed significantly higher scores on the memorization task leading the researchers

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[109]H. E. Walker, "Relationship Between Predicted School Behavior and Measures of Creative Potential" (Doctoral dissertation, University of Michigan, 1962).

[110]Mendelsohn, "Differential Use," pp. 431-436.

to conclude that incidental cue utilization, or breadth of attention deployment, underlies a sizable component of individual differences in RAT scores.[111] These findings were supported in a later study by Laughlin.[112] Wallach concluded from these studies the possibility that greater productivity and uniqueness of ideational associates may well rise because of a more diffuse or extensive deployment of attention in reception, storage and retrieval of information. This would be a disposition to deploy one's attention from the center to the periphery of a task context and be more ready to utilize incidental cues.[113]

Associative creativity now appeared to be in line with the testimony of creative persons who emphasized the importance of associative flow and the freedom to entertain wide-ranging associative possibilities in a playful manner. Based on these conclusions Wallach and Kogan developed measures of creativity that considered the importance of measuring the creation of abundant and unique associative materials within a playful context.[114] In their research

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[111] Ibid.

[112] Laughlin, "Incidental Concept," pp. 115-119.

[113] Wallach, "Creativity."

they found novel associates to be a function of greater response productivity and also found associative variables and convergent/divergent thinking to be orthogonal. Therefore, they looked for the mechanisms whereby some people could move outward from the most frequently encountered exemplars of a class to those that would be met only rarely. That is, a mechanism that accounts for productivity and uniqueness of associates may go beyond the near associations to generate further and more deviant ideas. The development by Wallach and Caron of measures of category width was a move in that direction.[115]

Maddi and his associates showed relationships between novelty of productions and associative uniqueness that were significant. They found that generating unique associates reflects a preference for unusual ideational content as well as coming about as a necessary consequence of high associative output.[116]

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[114]Wallach and Kogan, Modes of Thinking.

[115]M. A. Wallach and A. J. Caron, "Attribute Criteriality and Sex-Linked Conservatism as Determinants of Psychological Similarity," Journal of Abnormal Social Psychology, 1959, 59, 43-50.

[116]S. R. Maddi, and N. Berni, "Novelty of Productions and Desire for Novelty as Active and Passive Forms of the Need for Variety," Journal of Personlity, 1964, 32, 270-277.

CHAPTER III

METHODOLOGY

This study was an investigation of relationships among variables of cognitive style, creativity and flexibility. This chapter outlines the methodology used to conduct the investigation.

Subjects for the Study

The subjects for this study were 52 graduate students enrolled in educational administration courses at the University of Oklahoma. The population from which this sample was taken is the school administrators in the southwestern United States. All subjects were volunteers. The mean age was 33.2 years with a range from 23 to 60 years. There were 58% females and 42% males.

Testing Instruments Used

Group Embedded Figures Test

Cognitive styles of subjects were identified through the use of Witkin's[1] Group Embedded Figures Test (GEFT). This is a perceptual test which measures the subjects' ability to overcome the embedding context of a visual field by locating a simple geometric figure within a complex one. The measure of this variable is determined by the number of correct figures located within a specific time. This is a group administered test consisting of eighteen figures. The subject is asked to outline the required geometric figures with a pencil. The test is divided into three timed sections, one two-minute practice section, and two five-minute test sections. Total possible score is eighteen.

Norms are reported in the manual based on undergraduates at an eastern liberal arts college.[2] The mean for men was 12.0 with a s.d. of 4.1 based on 155 cases;

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[1]Witkin et al., A Manual for the Embedded Figures Test (Palo Alto, Calif.: Consulting Psychologists Press, 1971).

[2]Ibid.

for women the mean was 10.8 and s.d. of 4.2 based on 242 cases. The combined mean was 11.3 based on 397 cases.

The manual reported a reliability estimate of +.80 for a sample of 80 males and 97 females. This was based on a Spearman-Brown prophecy formula correlation between the first section of nine problems as opposed to the nine problems in the second section.

Concurrent validity is reported in the manual with correlations of -.82 for 73 males and -.63 for 68 females with scores on the Embedded Figures Test (EFT). Since the GEFT is a group form of the EFT the most direct criterion measure is the "parent" form of the test. Correlations of -.39 were reported for 55 males and -.34 for 68 females with the Portable Rod and Frame Test (PRFT). The negative correlations are in the expected directions because of the nature of the EFT and PRFT scores.[3]

Flexibility Tests

Two instruments were used to provide an index score of flexibility. The Pettigrew[4] Category Width Test

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[3]Ibid., pp. 28-29.

[4]T. F. Pettigrew, "The Measurement and Correlates of Category Width as a Cognitive Variable," Journal of Personality, 1958, 26, 532-544.

(CWT), as adapted by Wallach and Caron,[5] is a twelve item multiple-choice instrument which requires the subject to estimate the largest and smallest members of the given category. This is a pencil and paper test with no time limit. The subject reads the statements and indicates his choice by circling the appropriate item number. Odd-even reliability coefficient was +.76 for the sample of 151 children tested by Wallach and Kogan.[6] The reliability coefficient for the present subjects was computed using the Kuder-Richardson-20 and was calculated to be +.87.

The second flexibility measure used was the Necker Reversible Cube (RC). This is an optical illusion task which requires the subject to exhibit control over a reversible image.[7] The instrument measures the amount of figure-ground shift which is the ability to organize perceptual field forces rather than submit to them.

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[5]Wallach and Caron, "Attribute Criteriality."

[6]Wallach and Kogan, Modes of Thinking, p. 116.

[7]D. H. Heath and J. Orbach, "Reversibility of the Necker Cube: IV. Responses of Elderly People," Perceptual and Motor Skills, 1963, 17, 625-626; Newbigging, "Relationship"; J. Orbach, D. Ehrlich and H. A. Heath, "Reversibility of the Necker Cube: I. An Examination of the Concept of 'Satiation of Orientation'"; Perceptual and Motor Skills, 1963, 17, 439-458; R. L. Gregory, Eye and Brain: The Psychology of Seeing (New York: McGraw-Hill Book Co., 1973).

Reliability of the RC has been reported by Haronian and Sugerman to be .61 in a Pearson intercorrelation of reversals under neutral instructions and resistive instructions for 102 subjects. Newbigging calculated reliability on a group of six reversible figures (including a reversible cube) by intercorrelating the scores of the number of reversals on each figure. He obtained a r=0.82 with a theoretical value of .0.90 in a sample of 29 college students using the Pearson method.[8] Reliability in the present study was measured by a product moment correlation between scores on the first trial and those on the second trial. A coefficient of 0.88 was found in the sample of subjects.

Creativity Test

All subjects were tested for creativity using a group form of an adapted version of the Wallach and Kogan Creativity Test (W-KCT).[9] This series consists of five measures of associations, three verbal and two visual. The three verbal techniques were:

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[8]P. L. Newbigging, "The Relationship Between Rate of Reversal of Figures of Reversible Perspective and Empathy," Canadian Journal of Psychology, 1953, 7, 4, 172-176.

[9]Wallach and Kogan, Modes of Thinking.

(1) Instances. Subjects are required to give instances of a class described in verbal terms.

(2) Similarities. Subjects describe possible similarities between two verbally specific objects.

(3) Alternate uses. Subjects specify possible uses for a verbally specified object.

The two techniques using visual material were:

(4) Pattern meanings. Subjects are presented with a variety of pattern drawings and asked to tell what each drawing could be.

(5) Line meanings. Subjects are presented with a number of drawings in the form of continuous lines and are asked to generate meanings or interpretations for the drawings. The reliability reported by Wallach and Kogan was calculated by the split-half method according to the Spearman-Brown prophecy formula. The calculation for a sample of 151 children is as follows: instances-uniqueness, .51; instances-number, .75; alternate uses-uniqueness, .87; alternate uses-number, .93; similarities-uniqueness, .87; similarities-number, .93; pattern meanings-uniqueness, .88; pattern meanings-number, .93; line meaning-uniqueness, .82; and line meanings-number, .93.[10] Obviously all the measures

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[10]Ibid., p. 41.

concerning number of associates and uniqueness of associates for all procedures possess a high degree of internal consistency.

Reliability tests were extended to an item analysis to measure the extent to which every item contributed to the summed score for all items. All of the 78 item-sum correlations are .40 or better, and 71 of the 78 are .60 or better.[11]

A group administration version of the Wallach and Kogan test by Cropley to 124 male college undergraduates produced an internally consistency significant beyond the .01 level of confidence.[12] Cropley and Maslany tested 207 male and female undergraduate students on a group version of the Wallach and Kogan creativity test. KR20 coefficients of reliability reported high levels of internal consistency and high levels of reliability. They report the median intercorrelation among the Wallach-Kogan test as 0.441 (range: 0.267-0.742).[13]

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[11]Ibid., p. 42.

[12]A. J. Cropley, "A Note on the Wallach-Kogan Test of Creativity," The British Journal of Educational Psychology, 1968, 38, 2, 197-201.

[13]A. J. Cropley and G. W. Maslany, "Reliability and Factorial Validity of the Wallach-Kogan Creativity Tests," British Journal of Psychology, 1969, 60, 395-398.

This researcher conducted product-moment correlations using the Pearson method which resulted in the coefficients listed in Table 1. The two measures for each of the five procedures show substantial coefficients. All of these are .60 better. It is clear that measures concerning number of associates and uniqueness of associates possess a high degree of internal consistency.

Procedure

All subjects were tested continuously during sessions that ranged in time from one to two and a half hours. Three separate groups were tested and provided a total sample of 52. Subjects were first administered the Reversible Cube (RC) test, followed by the Group Embedded Figures Test (GEFT). This was followed by the Category Width Test (CWT) after which a short break was taken. When the subjects returned to the testing room, the Wallach and Kogan Creativity Test (W-KCT) was administered. All instruments were presented by the author and his assistant.

In administering the Necker Reversible Cube (RC), each subject was presented a sketch of the cube and instructions for reporting reversals. (A copy of these instructions are presented in Appendix A.) The subjects were first

TABLE 1

INTERCORRELATION AMONG THE TEN CREATIVITY MEASURES AND TOTAL CREATIVITY FOR THE TOTAL SAMPLE (N=52)

		2	3	4	5	6	7	8	9	10	11
1.	Instances-uniqueness	.790	.259	.370	.260	.286	.183	.058	.118	.137	.514
2.	Instances-number		.371	.501	.225	.438	.306	.325	.161	.354	.719
3.	Alternative uses-uniqueness			.727	.330	.437	.690	.597	.471	.482	.684
4.	Alternative uses-number				.469	.630	.660	.686	.594	.671	.877
5.	Similarities-uniqueness					.630	.302	.278	.440	.356	.514
6.	Similarities-number						.422	.530	.429	.612	.773
7.	Pattern meaning-uniqueness							.825	.608	.651	.722
8.	Pattern meaning-number								.549	.721	.778
9.	Line meanings-uniqueness									.703	.621
10.	Line meanings-number										.795
11.	Total creativity score										

Note: For 19 df, r's of .433 and .503 are significant at the .05 and .01 levels, respectively.

given a practice session to become familiar with the figure and the reversal phenomenon and the recording procedure. They were told to fixate the cube and record any reversals in the thirty second practice session. Instructions were then given for passive viewing followed by instructions to force the cube reversal as often as possible. This follows the procedure of Newbigging.[14] A tallying method similar to Bloomberg's was used whereby the subjects simply record the number of shifts by placing a mark on their paper for each shift.[15] Following the procedure established by Heath and Orbach[16] the cube test was administered in two one-minute periods with about thirty seconds separating the trials.

Scoring of the RC responses was accomplished by taking the number of reversals recorded on the first trial, passive instructions, as a base figure and subtracting that from the score on the second trial. The difference between these two scores constituted the individuals RC score.[17]

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[14]Newbigging, "Reversible Perspective and Embedded Figures."

[15]Bloomberg, "Creativity."

[16]Heath and Orbach, "Reversibility of Necker Cube."

[17]Following the scoring procedure of Bloomberg, "Creativity."

The Category Width Test (CWT) was administered following the procedure established by Wallach and Kogan.[18] This was the third instrument presented in the data gathering procedures. The CWT was administered by this researcher to the subjects in three separate groups.

This research attempted to maintain a gamelike atmosphere as suggested by Wallach and Kogan. The instrument was described as a "guessing game" to the subjects. The instructions were read to the subjects and were also printed on the instrument. (Instructions are included in Appendix B.)

The subjects were asked to circle their choice on each item on the form. Scores are obtained on the two parts of each item by assigning a value of 0, 1, 2 or 3 to the responses that are least to most discrepant from the central tendency provided for each item. The twenty-four values are summed to yield a total score. A large score indicates a preference for broad category widths while a small score reflects a preference for narrow category widths.

Scores taken from the RC and the CWT were converted

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[18] Wallach and Kogan, Modes of Thinking, p. 112.

to standard scores and intercorrelated using the Pearson method. A correlation of +.16 ($p > .05$ at .443) was found. Following this the two scores were summed for each individual to form a flexibility index score. The range of these scores was from .0 to 3.54. The mean was .69 with a s.d. of .86. Using .60 as a cutting point, the subjects were then divided into high flexible and low flexible classifications. Table 2 shows the division of subjects on this variable.

TABLE 2

SUBJECTS FLEXIBILITY CLASSIFICATION

Classification	Number Classified	Score Range Included
High Flexible	25	60 to 3.54
Low Flexible	27	-3.79 to 57

The GEFT was the second instrument administered. It was administered by the author following the exact instructions presented in the manual,[19] and on the front of the test instrument. The test included two practice

[19]Witkin et al., Manual, pp. 26-28.

problems followed by a two-minute practice period for solving seven problems. After this the subjects were given two five-minute periods in which to complete 18 problems. Scores were counted by simply summing the number of correct responses for a total score for each person. Subjects were divided by using a cutting point of 10 on the range of scores. Subjects scoring 10 or above were classified as high cognitive style (field-independent); those scoring below 10 were classified as low cognitive style (field-dependent). The number of subjects classified and the score ranges for each classification are shown in Table 3.

TABLE 3

SUBJECT CLASSIFICATION ON GEFT

Classification	Number Classified	Score Range Included
High Cognitive Style	26	10 to 18
Low Cognitive Style	26	0 to 9

The Wallach and Kogan Creativity Test (W-KCT) was administered in keeping with the gamelike procedures recommended by Wallach and Kogan.[20] There was an attempt made

[20]Wallach and Kogan, Modes of Thinking, pp. 26-38.

to provide a relaxed environment by suggesting to the subjects that they were free to move about the room or to leave the room if they wished to do so. The instrument was introduced as a game. An adult version of the Wallach and Kogan instructions was read to the subjects. It was also printed on the instrument. (See Appendix C for a sample copy of the instructions used.) No time limits were imposed and the subjects were encouraged to give as many responses as possible to each item. The instrument was in printed form with space for the subjects to record their responses.

The instrument contains five procedures for responses from the subjects: (1) Instances, (2) Similarities, (3) Alternative uses, (4) Pattern meanings, and (5) Line meanings.

Two variables are measured with the instrument: the number of unique responses produced, and the total number of responses produced. Uniqueness was defined as Wallach and Kogan did in the strict sense of "one of a kind." For each item in a procedure, a frequency distribution was constructed indicating the number of subjects in the total sample of 52 who gave a particular response to that item. This analysis was carried out for every response provided to that item. A response was counted

as unique if it was offered by only one out of the total 52 subjects. A subject's uniqueness score for a procedure as a whole consisted of the sum of his uniqueness scores for the various items which made up that procedure. His total uniqueness score was the sum of all unique responses on all five procedures.

A subject's number, quantity, score followed a similar summing procedure simply consisting of the aggregate of total responses for each item in each procedure for all five procedures. Thereby a total uniqueness score and a total number, quantity, of responses score was obtained for each subject. These two scores were used as separate measures of creativity and also summed and used as a creativity index for each subject. These scores ranged from 15 to 185. The classification of subjects into high creative and low creative was accomplished through a mean split. Table 4 presents these findings.

TABLE 4

SUBJECT CLASSIFICATION ON CREATIVITY

Classification	Number Classified	Score Range Included
High Creative	26	96 to 185
Low Creative	26	15 to 94

Statistical Design of the Study

The statistical analysis of data was performed in three major stages. In the first stage of analysis the two independent variables, field-independence/dependence cognitive styles and flexibility, were compared by means of the t-test in order to determine significant differences related to hypothesis 1 through 3.

In the second stage the variables were analyzed by means of analysis of variance for their interactive effects on the dependent variable creativity. This procedure was used to test hypothesis 4.

In the third stage of the analysis, a stepwise multiple regression analysis was used to test hypothesis 5. The criterion variable creativity was analyzed in relationship to the predictor variables flexibility and field-dependence/independence to determine the amount of variance in the criterion variable attributable to each of the predictor variables. This analysis was extended to the subparts of the creativity measure.

The Biomed Computer Program was used in all stages of this data analysis. The BMDP2D was used in the analysis of t-test, the BMDP2V was used in the analysis of variance, and the BMDP2R computed the stepwise multiple regression.

TABLE 5

INTERCORRELATION MATRIX

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1 SEX	1.00																	
2 AGE	-0.05	1.00																
3 UNIONESS	0.13	0.25	1.00															
4 QUANTITY	0.17	0.20	0.81	1.00														
5 COG. STYLE	0.31	0.01	0.44	0.45	1.00													
6 REVERS. CUBE	-0.05	-0.02	0.33	0.25	0.17	1.00												
7 CATEGORY WIDTH	-0.07	-0.05	0.36	0.38	0.46	0.16	1.00											
8 FLEX	0.13	-0.08	0.54	0.44	0.32	0.60	0.51	1.00										
9 INSTANCES-U	0.05	0.06	0.51	0.49	0.30	0.57	0.25	0.69	1.00									
10 INSTANCES-Q	0.13	0.13	0.53	0.74	0.38	0.40	0.35	0.61	0.79	1.00								
11 ALTERNATIVE-U	0.26	0.24	0.77	0.64	0.34	0.20	0.28	0.34	0.26	0.37	1.00							
12 ALTERNATIVE-Q	0.14	0.20	0.80	0.86	0.36	0.21	0.31	0.34	0.37	0.50	0.73	1.00						
13 SIMILARITIES-U	-0.02	0.25	0.57	0.48	0.12	0.31	0.12	0.33	0.26	0.23	0.33	0.47	1.00					
14 SIMILARITIES-Q	0.19	0.14	0.59	0.79	0.31	0.10	0.22	0.20	0.29	0.44	0.44	0.63	0.63	1.00				
15 PATTERN-U	-0.01	0.13	0.85	0.67	0.36	0.13	0.42	0.32	0.18	0.31	0.69	0.66	0.30	0.42	1.00			
16 PATTERN-Q	0.01	0.15	0.70	0.77	0.27	0.08	0.34	0.16	0.06	0.33	0.60	0.69	0.28	0.53	0.83	1.00		
17 LINE-U	0.19	0.25	0.77	0.56	0.35	0.03	0.10	0.22	0.12	0.16	0.47	0.59	0.44	0.43	0.61	0.55	1.00	
18 LINE-Q	-0.19	-0.09	0.69	0.79	0.34	0.00	0.27	0.26	0.14	0.35	0.48	0.67	0.36	0.61	0.65	0.72	0.70	1.00

Note: r's of .444 and .561 are significant at the .05 and .01 levels, respectively.

CHAPTER IV

ANALYSIS OF DATA

The beginning analysis of data is a correlational comparison of all variables. An intercorrelation matrix was computed. It was important to determine the bivariate relationship of the variables. These variables included the subparts of the creativity test. They were entered into the matrix as Wallach and Kogan divided the subparts of the test into five procedures each containing a measure of uniqueness and quantity.[1] No factor analysis conducted verify these. This intercorrelation is presented in Table 5.

The flexibility index was not significantly related to sex (r=+.13), and age (r=-.08), but significantly related to creativity-uniqueness (r=+.54), creativity-quantity (r=+.44) and total creativity (r=+.47), at the .05 level of

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[1]Wallach and Kogan, Modes of Thinking.

significance, and moderately, but not significantly related to cognitive style (r=+.32).

The measure of reversibility (RC) was found to be not significantly related to sex (r=-.04) and age (r=-.02). It demonstrated moderate but not significant relationship to creativity (total, r=+.26; uniqueness, r=+.33; quantity, r=+.25). Its relationship to both cognitive style (r=+.17) and category width (r=+.16) were not significant. A significant relationship was found with flexibility (+.60, significant at the .01 level of significance).

The category width measure (described on pages 71-72) was not significantly related to sex (r=-.07) or age (r=-.05). It was not significantly correlated with the uniqueness measure of creativity (r=+.36) or the quantity measure of creativity (r=+.38). Its relationship to cognitive style was significant at the .05 level (r=+.46). Its highest correlation was with flexibility (+.51, significant at the .05 level of significance).

Testing of Hypotheses 1 through 3

Hypotheses 1 through 3 were tested by computing Student's t-tests on the raw scores. Significant differences in flexibility and creativity among subgroups of the

subject were investigated. Hypothesis 1 examined differences in flexibility among subgroups of high and low cognitive style (field-independent, field-dependent respctively).*

H_1 Field-independent cognitive style subjects will score higher than field-dependent subjects on measures of flexibility.

H_{01} There is no significant difference between field-independent cognitive style subjects and field-dependent cognitive style subjects on measures of flexibility.

Mean differences were computed between field-independent and field-dependent subjects on measures of flexibility. Table 6 shows this difference:

TABLE 6

STUDENT'S t-TEST BETWEEN FLEXIBILITY SCORES OF HIGH AND LOW COGNITIVE STYLE GROUPS

Group	Mean	t Value	p[a]
High Cognitive Style(N=26)	.77	1.83	n.s.
Low Cognitive Style(N=26)	.16		

[a]At the .05 level of significance t=2.06.

* Note: See pp. 17-18 for the explanation of the form used in the statement of the hypotheses.

The results presented on Table 6 indicate that there is no significant difference between the high cognitive style (field-independent) subjects and the low cognitive style (field-dependent) subjects on their degree of flexibility. The null hypothesis cannot be rejected and the alternative hypothesis was not supported.

In hypothesis 2 the researcher examined the relationship between high and low (field-independent/field-dependent) cognitive style subjects with regard to their degree of creativity as measured on total creativity scores. Hypothesis 2 states:

H_2 Field-independent cognitive style subjects will score higher on creativity measures than will field-dependent cognitive style subjects.

H_{02} There is no significant difference between field-independent cognitive style subjects and field-dependent cognitive style subjects on measures of creativity.

Again, mean differences were computed between field-dependent/independent cognitive style subjects on measures of creativity. Table 7 shows this difference.

The null hypothesis 2 is rejected and the alternative hypothesis accepted. The high cognitive style (field-independent) subjects did score significantly higher on

total creativity scores than their low cognitive style (field-dependent) counterparts.

TABLE 7

STUDENT'S t-TEST BETWEEN CREATIVITY SCORES OF HIGH AND LOW COGNITIVE STYLE GROUPS

Group	Mean	t value	p[a]
High Cognitive Style(N=26)	111.5	3.25	.01
Low Cognitive Style(N=26)	80.3		

[a]At the .01 level of significance t=2.78.

The t-test was again used in testing hypothesis 3. The relationship between low and high flexible groups were tested on differences in creativity scores. Hypothesis 3 states:

H_3 High flexible subjects will score higher than low flexible subjects on measures of creativity.

H_{03} There is no significant difference between high flexible and low flexible subjects on measures of creativity.

Mean differences were computed on high and low flexibility groups on measures of total creativity. The results are shown in Table 8.

TABLE 8

STUDENT'S t-TEST BETWEEN CREATIVITY SCORES OF HIGH AND LOW FLEXIBILITY GROUPS

Group	Mean	t value	p[a]
High Creative(N=26)	115.8	1.06	n.s.
Low Creative(N=26)	86.2		

[a]At the .05 level of significance t=2.06.

Table 8 indicates no significant difference was found between the high and low flexibility groups on measures of creativity. The null hypothesis 3, therefore, cannot be rejected, and the alternative hypothesis 3 was not supported.

Testing Hypothesis 4

The two-way analysis of variance was used to test for hypothesis 4 which is:

H_4 The interaction between cognitive style and flexibility will be significant in that the high flexible/field-independent cognitive style subjects will score significantly higher on measures of creativity than the low flexible/field-dependent subjects.

H_{04} There is no significant interaction between the degree of flexibility and the level of cognitive style in predicting creativity.

It was expected that the independent variables, cognitive style and flexibility would have an interaction effect on the dependent variable creativity. The analysis of variance was conducted in a series of three analyses using different aspects of the dependent variable on each run. In Chapter III of this study the measure of creativity was presented in the form used by Wallach and Kogan in their research. That research maintained two separate measures of creativity, quantity of associates produced and uniqueness of associates produced (see pages 73-76). In order to maintain a comparative relationship to this earlier study, it was decided to keep these distinctions while measuring for creativity. This present study, therefore, actually includes three measures of creativity: quantity, uniqueness, and a total creativity score which combines quantity and uniqueness. The first run used creativity-uniqueness. The results of this analysis are displayed in Tables 9 and 10.

The researcher concluded that the F value for the interaction effect of cognitive style and flexibility was not significant at the .05 level of significance. Based on this finding it is evident that the hypothesis of interaction cannot be supported when using creativity-uniqueness

TABLE 9

ANALYSIS OF VARIANCE COMPARING SUBJECTS ON COGNITIVE STYLE, FLEXIBILITY AND CREATIVITY-UNIQUENESS

Measures	Degrees of Freedom	Mean Square	F	p
Cognitive Style	1	445.	8.9	0.004
Flexibility	1	378.	7.6	0.008
Cog. St.-Flex.	1	8.	0.1	0.678
Error	48	49.		

TABLE 10

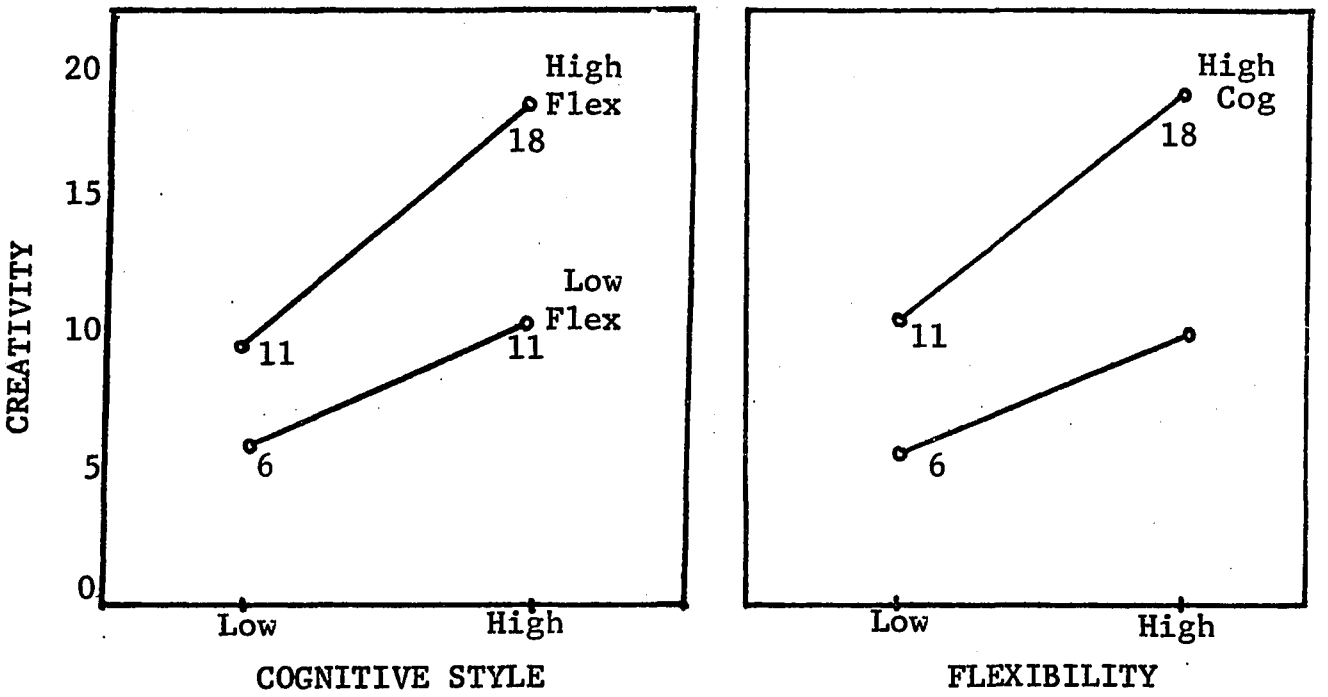
CELL MEANS AND STANDARD DEVIATIONS FOR DEPENDENT VARIABLE CREATIVITY-UNIQUENESS

COGNITIVE STYLE FLEXIBILITY	LOW LOW	LOW HIGH	HIGH LOW	HIGH HIGH
Mean	6	10.9	11.4	18
SD	4.6	7.1	9.8	8.3

as the dependent variable. However, both cognitive style alone and flexibility alone exhibit significant main effects. Tables 11 and 12 indicate these relationships.

TABLE 11

RELATIONSHIP BETWEEN HIGH AND LOW COGNITIVE STYLE, AND HIGH AND LOW FLEXIBILITY ON MEASURES OF CREATIVITY-UNIQUENESS



The second run of the analysis of variance used the same independent variables of cognitive style and flexibility but substituted creativity-quantity as the dependent variable. The results of this analysis are found in Tables 12 and 13.

TABLE 12

ANALYSIS OF VARIANCE COMPARING SUBJECTS ON COGNITIVE STYLE, FLEXIBILITY AND CREATIVITY-QUANTITY

Measures	Degree of Freedom	Mean Square	F	p
Cognitive Style	1	4785.	5.11	0.028
Flexibility	1	7012.	7.49	0.009
Cog. St-Flex.	1	663.	0.70	0.404
Error	48	935.		

TABLE 13

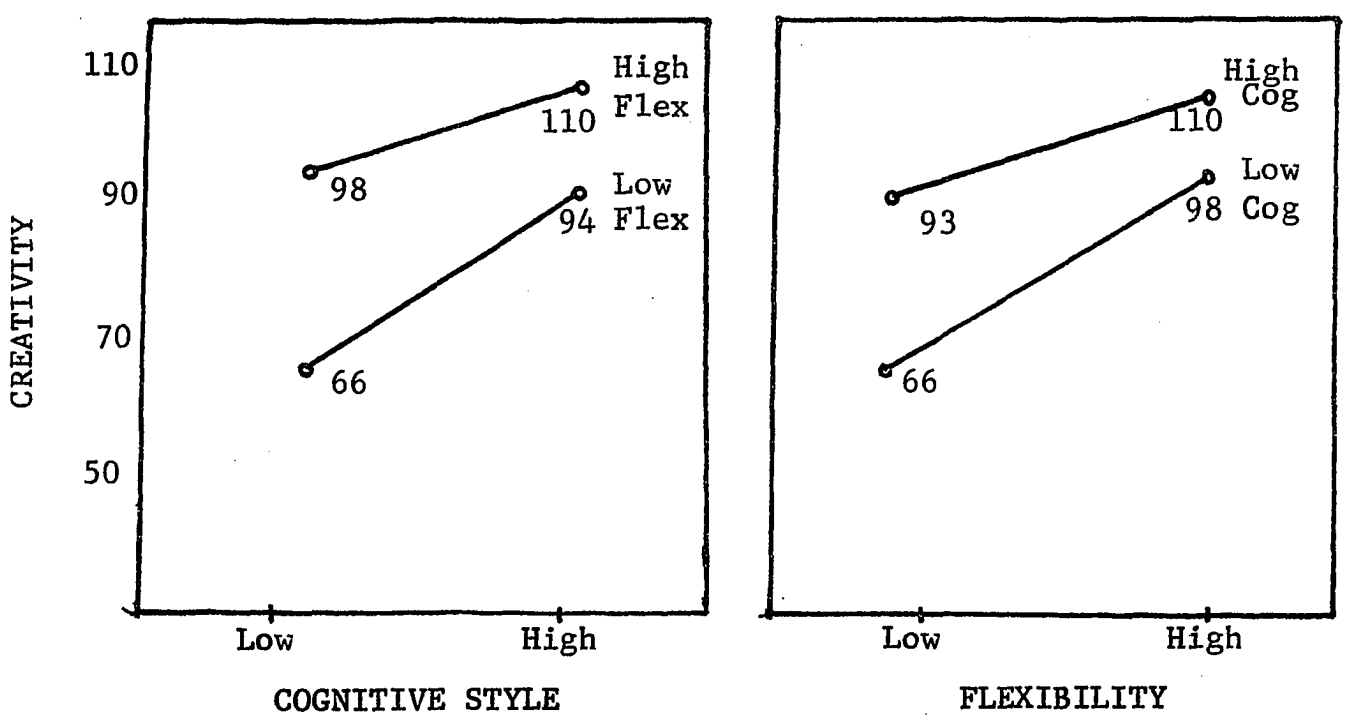
CELL MEANS AND STANDARD DEVIATIONS FOR DEPENDENT VARIABLE CREATIVITY-QUANTITY

COGNITIVE STYLE FLEXIBILITY	LOW LOW	LOW HIGH	HIGH LOW	HIGH HIGH
Mean	65.8	98.0	93.7	110.8
SD	29.5	29.1	33.9	31.0

The F value for this analysis was less than necessary to confirm the predicted interaction effect. The two separate independent variables of cognitive and flexibility were found to be significant, cognitive style at the .05 level and flexibility at the .01 level of significance. The main effect of these variables is portrayed in Table 14.

TABLE 14

RELATIONSHIP BETWEEN HIGH AND LOW COGNITIVE STYLE, AND HIGH AND LOW FLEXIBILITY ON MEASURES OF CREATIVITY-QUANTITY



The last analysis of variance used the two independent variables of cognitive style and flexibility with creativity-total as the dependent variable. Tables 15 and 16 show the results of that analysis.

TABLE 15

ANALYSIS OF VARIANCE COMPARING SUBJECTS ON COGNITIVE STYLE, FLEXIBILITY AND CREATIVITY-TOTAL

Measures	Degrees of Freedom	Mean Square	F	p
Cognitive Style	1	8152.	6.21	0.016
Flexibility	1	10647.	8.10	0.006
Cog. St-Flex.	1	520.	0.39	0.532
Error	48	1313.		

TABLE 16

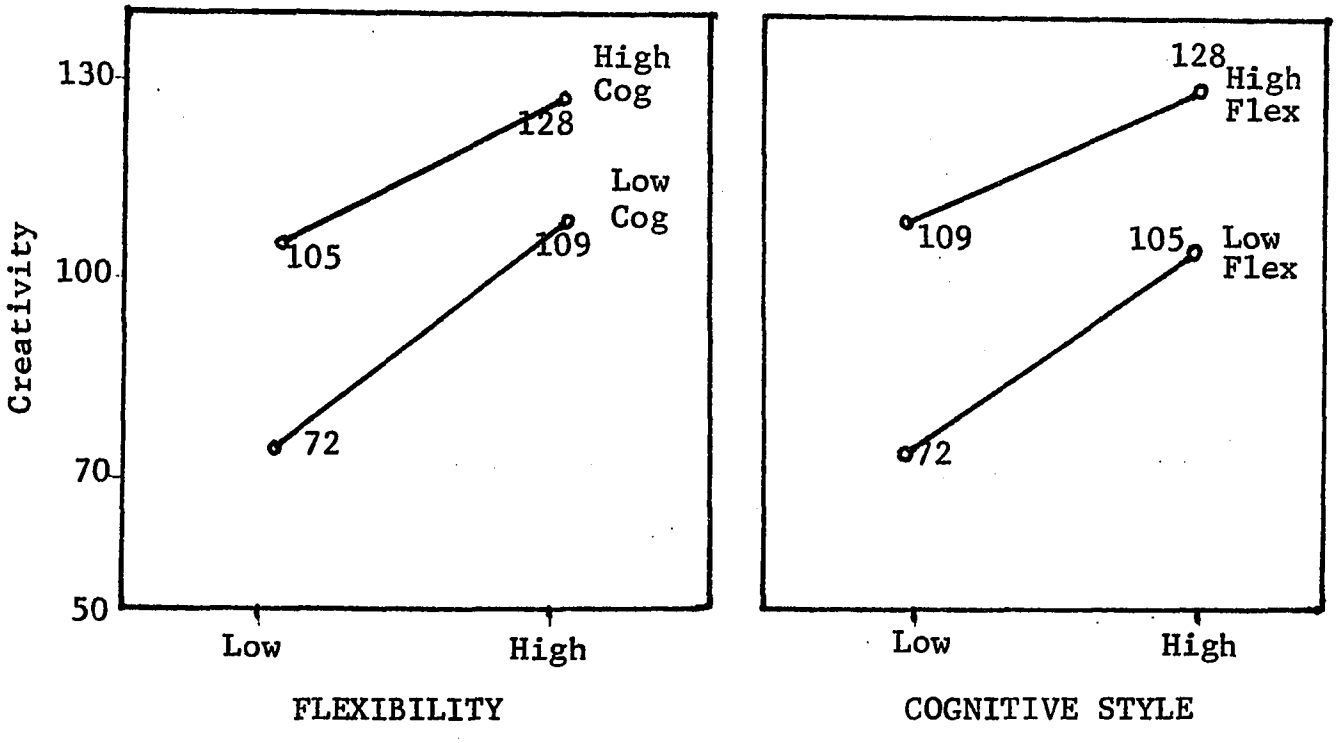
CELL MEANS AND STANDARD DEVIATIONS FOR DEPENDENT VARIABLE CREATIVITY-TOTAL

Cognitive Style Flexibility	Low Low	Low High	High Low	High High
Mean	71.8	109.0	105.2	128.8
SD	33.0	35.2	42.8	37.4

No significant interaction effect was discovered through the final analysis of variance procedure. As demonstrated in both of the preceding analyses, both independent variables demonstrated significant independent relationships to the dependent variable at or beyond the .01 level of significance. The relationship of these variables is shown in Table 17.

TABLE 17

RELATIONSHIP BETWEEN HIGH AND LOW COGNITIVE STYLE, AND HIGH AND LOW FLEXIBILITY ON MEASURES OF CREATIVITY-TOTAL



Based on the series of analysis of variance conducted null hypothesis 4 was accepted and the alternative hypothesis was rejected. No evidence was found to support the hypothesized interaction relationship between cognitive style and flexibility in relationship to higher scores on creativity. In all three versions of this analysis of variance, however, a main effect was found for both cognitive style and flexibility.

Testing of Hypothesis 5

H_5 The predictor variables of flexibility and cognitive style optimally predict the criterion variable of creativity.

H_{05} The predictor variables of flexibility and cognitive style do not optimally predict the criterion variable of creativity

Hypothesis 5 was tested through a series of multiple regression analyses. Multiple regression was selected because it is a statistical technique which analyzes the relationship between a dependent or criterion variable and a set of independent or predictor variables. It seeks to assess the logical consequences for determining the importance of predictor variables in accounting for variance in the dependent variable. Because this study sought to predict which variables would optimally predict

creativity, the stepwise format was selected. The stepwise multiple regression analysis indicates the available predictor variables that would yield an optimal prediction equation with as few terms as possible. In this procedure the computer enters variables in single steps from best to worst provided that they meet the statistical criteria. The variable that explains the greatest amount of variance in the dependent variable will enter first; the variable that explains the greatest amount of variance in conjunction with the first will enter second, and so on.

In the stepwise multiple regression a series of analyses were performed. The first stepwise regression used creativity-total as the criterion variable and entered all eighteen predictor variables. Ten of the predictor variables were subparts of the criterion variable. The analysis sought to discover which of these variables were most important in accounting for the variance of the criterion variable creativity. The results of this stepwise multiple regression are found in Table 18.

Based upon the results of the first stepwise regression, two additional stepwise regressions were performed. In the first one only the quantity measure of creativity was taken as the criterion variable. The

TABLE 18

SUMMARY OF STEPWISE MULTIPLE REGRESSION FOR CREATIVITY SUBPART VARIABLES AND TOTAL CREATIVITY

Step	Variable	r	r^2	Increase in r^2
1	Alternative-Quan	.877	.769	.769
2	Instances-Quan	.935	.874	.105
3	Line-Quan	.973	.946	.072
4	Similarity-Quan	.984	.968	.022
5	Pattern-Quan	.993	.987	.018
6	Line-Uniq	.995	.991	.002
7	Instances-Uniq	.997	.994	.002
8	Alternative-Uniq	.998	.995	.001
9	Similarities-Uniq	.998	.996	.0007

predictor variables used were creativity-uniqueness scores, cognitive style scores, reversible cube scores and category width scores. The intercorrelation matrix for this variable is shown in Table 19, and the stepwise entry of these variables is represented in Table 20.

The high correlation between cognitive style and creativity-quantity (r=.45) shown in the intercorrelation table placed cognitive style as the first variable to be entered in the stepwise procedure. It accounted for 20% of the variance in the criterion variable and had a F ratio of 12.56 (significant at the .01 level).

TABLE 19

CORRELATION MATRIX FOR STEPWISE REGRESSION USING CREATIVITY-QUANTITY AS CRITERION VARIABLE

Variable	1	2	3	4
1. Quantity	1.000			
2. Cognitive Style	0.448*	1.000		
3. Reversible Cube	0.245	0.166	1.000	
4. Category Width	0.381*	0.464*	0.161	1.000

*$p < .01$

TABLE 20

SUMMARY OF STEPWISE MULTIPLE REGRESSION FOR CREATIVITY-QUANTITY AS CRITERION VARIABLE

Step	Variable	r	r^2	Increase in r^2
1	Cognitive Style	.448	.200	.200

The second stepwise regression analysis was conducted using the predictor variables of creativity-quantity scores, cognitive style scores, reversible cube scores and category width scores. The criterion variable was creativity-

uniqueness. The results of this analysis are displayed in Table 21.

TABLE 21

SUMMARY OF STEPWISE MULTIPLE REGRESSION FOR CREATIVITY-UNIQUENESS AS CRITERION VARIABLE

Step	Variable	r	r^2	Increase in r^2
1	Cognitive Style	.442	.195	.195
2	Reversible Cube	.514	.264	.069

Cognitive style, again represented the most important determining element in the prediction of creativity representing 19.5% of the variance. The regression entered reversible cube as a second contributor accounting for about 7% of the variation. Reversibility also demonstrated an F ratio of 8.82 which is significant at the .01 level of significance.

Both cognitive style and flexibility were, therefore, found to be significant in predicting creativity. The null hypothesis 5 was thereby rejected and the alternative hypothesis accepted.

CHAPTER V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Summary

This study investigated the relationship between measures of cognitive style, flexibility and creativity. The problem addressed by this study was the question of predicting creativity by means of cognitive style and flexibility measures. A second question associated with this is: In what manner and to what extent are these three variables interrelated. The purpose of this research was, therefore, to demonstrate the interrelationship of field-dependent/independent cognitive style, flexibility and creativity. This study, in short, sought to assess the interaction relationship between cognitive style and flexibility and also the influence of these two variables in predicting creativity.

The sample for this research was 52 graduate students enrolled in educational administration courses.

These subjects were administered the Group Embedded Figures Test (GEFT), the Reversible Cube (RC) test, the Category Width Test (CW), and the Wallach-Kogan Creativity Test (W-KCT). The mean age of the sample was 33.2 years with 22 males and 30 females.

In the first stage of the analysis of the data, an intercorrelational matrix examined the degree of relationship between the variables. From this the variables were reduced to three: one measure for cognitive style, one index of flexibility and a composite measure of creativity.

The second stage of the analysis tested hypotheses 1 through 3 by means of the Student t-Test. This provided an individualized comparison of subgroup means found in the high and low cognitive style score, high and low flexibility scores, and high and low creativity scores. With this elementary comparison a basic understanding of the subgroup composition was established.

Following the t-Test, a series of one-way analysis of variance procedures was conducted. It was the intention of this phase of the study to focus on the interrelationship of the three principle variables, cognitive style, flexibility and creativity. This analysis was conducted using the two independent variables, cognitive style

and the flexibility index to indicate their interrelationship to creativity in terms of quantity of responses, creativity in terms of uniqueness of responses and creativity as a combined measure of quantity and uniqueness.

The third major stage of the analysis was a series of stepwise multiple regression analyses which sought to select the strongest predictor variables of creativity. The first regression entered all the components in an effort to determine priority and importance of the subparts of the three major variables. This led to the next application of regression procedures to examine the separate contributions of the GEFT, RC and CW scores in predicting both quantitative and uniqueness characteristics of creativity. This was accomplished through three subsequent regression procedures.

Discussion and Conclusion

Associative Creativity

Based upon the associative theory of creativity, it was expected that unique associates emerge later in the associational sequence.[1] That is, they are part of

[1]Wallach and Kogan, Modes of Thinking, p. 37.

the flat gradient of slower but larger numbers of responses.[2] This provides, then, an approach by which the magnitude of relations between quantity and uniqueness of associates may be examined. Strong positive correlations between quantity and uniqueness would, therefore, substantiate this position.

Table 5 (p. 85) presents the correlation between uniqueness and number of responses of .81. It indicates they are significantly related ($p < .01$), supporting the associative theory of creativity that unique associates should increase as the total number of associates produced becomes larger. Also, indicated in Table 1 (p. 77) is the intercorrelation between the separate items which make up each of the five measures of creativity thereby providing evidence that the creativity scale is a unified dimension.

The most convincing support for the associative theory that quantity of associative production is the most important factor in determining uniqueness came from the regression analysis procedures. In the analysis that used total creativity as the criterion variable, all five of the quantity indicators took priority of entry into the

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[2]Mednick, "Associative Basis."

regression equation. The alternative quantity element alone accounted for 76% of the variance (see Table 18, p. 100).

This study, therefore, supports the associative definition of creative that ideational fluency (quantity of responses) permits the individual to scan and retrieve remote, though appropriate, association for use in new contexts. This ability is considered by Wallach to depend upon breadth of attention deployment.[3] The individual with highly stereotyped responses tends to cluster his responses in a "steep" gradient of responses as compared to the more creative person who is able to expand his thinking to the more remote associations (see Figure 2, p. 65).

In this study the more "playful" approach of administering the creativity test appears to support Wallach and Kogan's thesis that a playful and unrestricted application of these measures permits a wider and more novel production of associates.[4]

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[3]Wallach, "Creativity."

[4]Wallach and Caron, "Attribute Criteriality"; and Maddi and Berni, "Novelty of Productions."

Cognitive Style and Flexibility

The results of this study did not find support for the sex related differences reported by Witkin et al.[5] Of the 30 females in this study, 60% were field-independent while only 32% of the 22 males were field-independent. It may be explained in the fact that females engaged in administrative pursuits would be expected to be more analytical than usual.

A primary concern of this study was the proposed theoretical dimension of flexible cognitive styles. The theory mentioned earlier by Werner and Witkin posited the field-independent style as existing in one of two modes, either fixed or mobile.[6] As shown in Table 6 (p. 87), there was a nonsignificant relationship found among groups of high and low cognitive styles with regard to flexibility. Since the first null hypothesis was supported, it appears questionable indeed that there are categories of flexible and nonflexible field-independent persons. The previous studies on flexibility were criticized by Eisner[7] because

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[5]Witkin et al., Personality through Perception; and Witkin et al., "Stability."

[6]Werner, Comparative Psychology; and Witkin et al., Psychological Differentiation.

[7]Eisner, "Developmental Relations."

the subjects of the studies were restricted to 19 year olds and, therefore, at an age found to be more dominantly field-independent and therefore, unrepresentative of the possible ranges of cognitive styles. The present study sought to control for this by seeking an older group of subjects. The mean age for this study was 33 years. This higher age category did provide a more heterogenous distribution of cognitive styles. However, the flexibility distinction was not found.

One explanation of this is the measure of flexibility used. None of the previous studies mentioned in Chapter II agreed on what constitutes a theoretical understanding of flexibility. In addition they did not provide a reliable instrument for measuring flexibility.

Flexibility was also found to be nonsignificant in relationship to high and low creativity groups (see Table 8, p. 90). However, when flexibility and cognitive style were examined by means of the two-way analysis of variance to determine their single and combined contribution to the variance in three different measures of creativity, flexibility demonstrated a significant relationship to creativity-uniqueness (Table 9, p. 92), creativity-quantity (Table 12, p. 94), and creativity-total (Table 15, p. 96).

One of the major hypotheses of this study (4) was that an interaction of high flexibility and high cognitive style would relate significantly to high scores on creativity. As previously mentioned, this interaction hypothesis was not supported. Based upon what has been reviewed above with regard to flexibility, it is apparent that the link between high cognitive style and creativity is not flexibility. This conclusion is in agreement with Bloomberg[8] and Del Gaudio.[9]

An interesting finding relative to this "missing link" was the discovery that while the reversible cube and the category width measures which compose the flexibility index exhibited only a weak relationship (.16), they separately demonstrated a nonsignificant relationship to total creativity. The RC measure correlated .27 and the CW measure .39 with total creativity and combined as the flexibility index they showed a significant correlation of .47 ($p < .05$, see Table 5, p. 85).

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[8]Bloomberg, "Creativity."

[9]Del Gaudio, "Psychological Differentiation."

Predictors of Creativity

The major hypothesis (5) of this study was that creativity could be predicted with measures of cognitive style and flexibility. The series of stepwise multiple regression conducted in this research lend support to this hypothesis. The separate but significant relationships between cognitive style and creativity and flexibility and creativity found in the analysis of variance procedures (Tables 9 through 17) were confirmed and extended by the more powerful regression analysis (Tables 19 through 21). In this procedure the correlation of .45 and the p value of .01 for the cognitive style relationship to creativity-quantity indicating that the person with high cognitive style (field-independent) is more likely to rank higher on creativity than the field-dependent subject. In the second regression creativity-uniqueness there was a similar finding concerning the importance of high cognitive style and creativity. In this analysis the .01 level of significance was again reached and cognitive style accounted for 19.5% of the variance in creativity (Table 21, p. 102). The reversible cube measure entered on the second step of the regression accounting also being significant at the .01

level of significance and accounting for 7% of the criterion variance.

It is apparent from these findings that while both high cognitive style and high flexibility provide some measure of predictability of creativity, the total variance in the criterion variable is not accounted for. Wallach and Kogan have successfully partitioned creativity from general intelligence.[10] It remains to be seen if creativity can also be successfully explained.

Summary of Findings

1. The associative theory of creativity that unique creativity responses are positively related to the quantity of associations produced was supported in this study. This study found the level of significance to be .01.

2. The Wallach-Kogan Creativity Test demonstrated internal consistency. This instrument appears to provide a reliable measure of associative creativity.

3. The flexibility index showed that there was no distinction on this measure by either age or sex suggesting

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[10] Wallach and Kogan, Modes of Thinking.

the possibility in keeping with more recent research on rigidity that increase in age does not automatically predict an increase in rigidity.

4. The flexibility index showed important correlation to both creativity and cognitive style but could not distinguish between high and low cognitive styles, and only provided a limited predictor of creativity.

5. Both the Reversible Cube (RC) measure and the Category Width Test indicated substantial relationships to measures of creativity and cognitive style and showed low intercorrelation. It appeared that these measures may be separate components of yet an unknown quality of flexibility.

6. Cognitive styles were found to be unrelated to age and sex difference. In this study, 60% of the females were field-independent while only 32% of the males were field-independent. This does not support earlier findings by Witkin that females are slightly more field-dependent than males.

7. The theory of differentiation suggested that field-independents may be either "fixed" or "mobile." That is they have the ability to move from field-independence to field-dependence. This study found no support for this theory. Flexibility was not differentially

distributed among the subjects based on cognitive style.

8. There was no interaction effect found between cognitive style and flexibility in relationship to creativity. Both cognitive style and flexibility demonstrated significant main effects with creativity.

9. The final analysis of creativity predictors revealed field-independent cognitive style as the most important single predictor.

Recommendations

1. The researcher determined that future investigations of this type might attempt to test more extreme cases of field-dependence/independence. It has still not been established whether or not the degree of field-dependent/independent is significantly related to factors of personality. Field-dependent/independent has been accepted as a polarity continuum with only the relativity of differences regarded as important.

2. It is recommended that more research be conducted in the area of flexibility. There is a need for a study which would replicate and combine earlier research so that some common measures and instrumentation could be developed.

3. More study needs to be conducted which connects the associative model of creativity with individuals recognized for their creative productions.

4. The last recommendation is that cognitive style studies should be more directly related to creativity studies. A sizable overlap appears to be unaccounted for in these two modes of behavior.

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APPENDIX A

CATEGORY WIDTH TEST

GUESSING GAME

Instructions: In this game you are asked to guess about things in our world. For instance, if you knew that most adult men in the world are about 5 feet and 7 inches tall, you might guess that the tallest man in the world is 7 feet tall, or 8 feet tall. And you might guess that the shortest man in the world is 4 feet tall or only 3 feet tall.

APPENDIX B

INSTRUCTIONS FOR THE REVERSIBLE CUBE

This is a perceptual experiment that requires you to look at a cube figure and notice changes that occur to the cube. The cube may reverse itself. When I say begin, I would like you to look at the cube and see if it reverses itself. Do not force the cube to reverse. This will be a practice session. Each time the cube reverses, place a mark in the upper half of the A section of your paper. Be sure that you don't take your eyes off of the cube while you make the mark. O.K. begin. (Time for 30 sec.) Then say, Stop. Are there any questions?

When I tell you to begin this time, look at the cube continuously as you did before. Do not move your eyes away from the cube during the time of the session. Keep your pencil on your paper in the lower half of the A section of the paper and again place a mark each time the cube reverses itself. Please don't force the cube to reverse. Are there any questions? O.K. begin. (Time for 60 sec. and then say: Stop.)

Now on this trial I would like you to attempt to make the cube reverse as often as possible. Stare at the cube in the manner you did in the other sessions but this time force the cube to reverse. Use only your eye movements

to manipulate the cube. Place a mark in the B section of your paper each time the cube reverses. Are there any questions? O.K. begin. (Time for 60 sec.) Say Stop.

APPENDIX C

WALLACH-KOGAN CREATIVITY TEST

MIND GAMES

Instructions: The purpose of these games is to give your mind a chance to play. You are encouraged to approach each of these games in an open and relaxed manner. There are no right or wrong answers. There is no time limitation on any of the items or on the total five games. Feel free to move around the room if you wish.

The object of these games is for you to generate as many ideas as possible in each game. You may write on both sides of the sheets and there is more paper at the front of the room.

Proceed through this booklet at your own pace. After you have listed all the responses you can think of for one item, move to the next one, and likewise with each game.

I. INSTANCES GAME

In this game your job is to name as many things as you can think of that are like the subjects mentioned in the statements below. For example, you might be given the statement "things that hurt." You would then name all the things you can think of that hurt, such as, "falling down," "slapping," "fire," or a "knife." Simply list your answers in the space provided. Remember, when you have listed all the responses you can think of move on to the next item.

II. ALTERNATIVE USES GAME

In this game you are to list all the different ways certain objects could be used. For example, if you are given the object "string," you might list that it could be used to attach a fish hook, to jump rope, to sew with, to hang clothes on, and to pull shades.

III. SIMILARITIES GAME

In this game two objects will be mentioned and you are to list all the ways that these objects are alike. For example, the two objects might be an apple and an orange. Your answer might be that they are both round, sweet, have seeds, both are fruits, both have skins, both grow on trees, etc.

IV. PATTERN MEANINGS GAME

Your next set of games asks you to think of as many possible meanings as you can for a number of abstract designs. The design below is an example. Listed below it are some of the possible meanings that have been given to it.

Now look at each design on the following pages one at a time and list all the possible interpretations you can think of. You can turn the pictures any way you want to.

Turn the page and begin.

V. LINE MEANINGS GAME

This game is like the Pattern Meanings Game except this time you are given a series of line drawings. Your job is to list as many meanings as you can for each picture. Feel free to turn the pictures any way you want. Begin with the picture on the next page and continue through all four pictures.

List your meanings below each picture. You may use the back of the page if you need more space.

APPENDIX D

RAW DATA

RAW DATA

NO.	SEX	AGE	MGR	UNIQ	QUAN	COGST	RC	CW	FLEX INDEX	INST-U	INST-Q	ALTR-U	ALTR-Q	SIM-U	SIM-Q	PAT-U	PAT-Q	LINE-U	LINE-Q
01	2	51	1	20	106	10	07	57	00030	00	23	07	32	02	21	09	21	09	09
02	1	33	1	14	091	06	23	63	00236	02	20	03	19	01	18	06	16	02	18
03	2	32	1	12	119	10	-5	55	00083	03	32	03	31	02	27	03	12	01	17
04	1	28	1	08	076	16	10	57	00060	01	15	00	10	03	28	01	09	03	14
05	1	27	2	05	047	02	05	47	00-46	00	03	00	13	00	12	04	10	01	09
06	1	30	1	05	115	10	10	67	0-134	03	25	00	32	02	33	00	11	00	14
07	1	24	1	13	112	02	11	57	00070	02	22	02	30	03	31	04	20	02	09
08	2	33	1	07	067	14	11	60	00092	02	20	01	18	01	15	01	07	01	07
09	1	30	1	06	090	08	16	58	00128	00	22	00	14	02	25	04	19	00	10
10	1	40	1	15	117	12	26	62	00259	12	76	00	14	01	18	02	06	00	03
11	2	29	2	08	115	06	22	54	00159	04	34	02	28	00	30	01	11	01	12
12	1	33	2	08	045	00	04	22	0-160	00	08	00	14	01	14	04	09	03	08
13	2	30	2	01	014	02	-4	46	00022	00	00	00	00	01	14	00	00	00	00
14	1	29	1	09	097	08	-3	56	00112	01	23	01	21	01	21	04	14	02	18
15	1	35	1	07	083	16	02	52	00-58	01	18	00	14	01	17	04	13	01	11
16	1	50	1	05	078	00	06	33	0-158	01	16	01	18	01	19	02	14	00	11
17	2	23	2	10	092	08	05	59	00113	00	24	02	19	01	17	03	16	04	16
18	2	30	2	03	038	14	26	34	00052	01	09	01	07	01	13	00	05	00	04
19	2	37	1	05	062	04	-2	42	00012	00	13	01	15	01	18	01	03	02	13

RAW DATA (CON'T)

NO.	SEX	AGE	MGR	UNIQ	QUAN.	COGST	RC	CW	FLEX INDEX	INST-U	INST-Q	ALTR-U	ALTR-Q	SIM-U	SIM-Q	PAT-U	PAT-Q	LINE-U	LINE-Q
20	2	48	1	09	095	10	13	32	00-95	01	14	00	18	01	17	00	17	06	19
21	2	27	2	08	081	12	03	44	00023	01	19	00	13	01	24	03	13	03	12
22	2	36	2	14	096	14	08	58	00-47	02	20	03	21	02	28	05	11	02	16
23	2	32	1	08	086	17	06	57	00-20	01	18	01	18	01	23	03	15	02	12
24	2	31	1	12	203	03	-2	12	0-204	03	19	01	21	03	40	00	07	05	16
25	2	36	1	11	106	08	-5	43	00-05	00	28	03	27	00	17	03	17	05	17
26	1	34	1	09	102	06	04	68	00081	00	17	00	24	02	23	06	20	01	18
27	2	31	2	18	134	14	19	55	00136	04	44	02	35	01	21	07	19	04	15
28	2	31	1	09	115	18	-1	61	00169	02	39	03	22	00	25	03	14	01	15
29	2	35	1	30	155	08	30	54	00240	02	36	04	34	06	35	10	23	08	27
30	2	40	1	10	089	12	-1	45	00050	00	17	01	17	03	32	01	12	05	11
31	2	34	1	23	150	17	13	52	00053	04	40	04	26	00	34	11	26	04	24
32	2	26	2	13	054	17	-1	68	00221	02	10	00	16	00	09	05	06	06	13
33	2	40	1	06	060	09	04	67	00073	00	13	00	12	01	17	04	12	01	06
34	2	33	2	08	108	09	-1	40	00013	01	23	01	23	00	22	04	23	02	17
35	1	60	1	31	149	18	12	60	00102	03	28	04	43	04	38	09	20	11	20
36	1	26	2	33	152	16	04	60	00021	01	18	05	44	01	29	17	36	09	25
37	2	30	1	16	109	16	09	65	00109	02	22	03	21	01	34	07	17	03	15
38	2	30	2	08	069	08	08	43	00-19	01	15	00	18	00	10	02	11	05	15

RAW DATA (CON'T)

NO.	SEX	AGE	MGR	UNIQ	QUAN	COGST	RC	CW	FLEX INDEX	INST-U	INST-Q	ALTR-U	ALTR-Q	SIM-U	SIM-Q	PAT-U	PAT-Q	LINE-U	LINE-Q
39	1	30	1	06	058	09	03	30	00-81	02	17	02	20	01	10	00	05	01	06
40	2	34	2	07	066	08	13	53	00060	00	09	03	20	00	17	02	14	02	06
41	2	34	2	28	129	16	38	49	00284	09	33	04	42	05	29	06	13	04	12
42	1	42	1	03	040	07	04	41	0-119	00	11	01	13	00	06	01	06	01	04
43	1	24	1	03	046	08	25	37	00064	01	13	00	08	01	11	01	09	00	05
44	1	30	1	00	035	08	09	58	00057	00	07	00	12	00	08	00	04	00	04
45	2	23	2	01	061	10	13	41	00-28	00	14	01	17	00	19	00	08	00	03
46	1	31	1	09	061	10	07	56	00023	01	15	02	14	01	15	03	12	02	05
47	1	31	1	01	039	04	21	37	00023	00	11	00	09	00	09	00	04	01	06
48	1	31	1	02	025	04	06	54	00-02	01	08	00	07	00	11	01	04	00	05
49	2	29	1	25	124	14	31	68	00354	10	43	04	28	01	21	06	14	04	17
50	2	32	1	01	038	04	01	10	0-379	00	08	00	11	00	11	01	04	00	04
51	2	30	2	00	087	16	11	47	00014	00	25	00	22	00	24	00	05	00	11
52	1	41	2	06	077	01	12	44	00-16	03	23	00	13	01	22	02	13	00	06