CREATIVITY AND COGNITIVE STYLE

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by
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# Table of Contents

<table>
<thead>
<tr>
<th>Acknowledgments</th>
<th>ii</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table of Contents</td>
<td>iii</td>
</tr>
<tr>
<td>Tables</td>
<td>iv</td>
</tr>
<tr>
<td>Introduction</td>
<td>1</td>
</tr>
<tr>
<td>Chapter I. The Literature</td>
<td>3</td>
</tr>
<tr>
<td>The Early Conceptions</td>
<td></td>
</tr>
<tr>
<td>The Sequential Theories</td>
<td></td>
</tr>
<tr>
<td>The Nature of the Creative Process</td>
<td></td>
</tr>
<tr>
<td>The Development of Cognitive Style</td>
<td></td>
</tr>
<tr>
<td>The Relationship between Creativity and Cognitive Style</td>
<td></td>
</tr>
<tr>
<td>Hypothesis to be tested</td>
<td></td>
</tr>
<tr>
<td>Chapter II. The Procedure</td>
<td>24</td>
</tr>
<tr>
<td>The Measures</td>
<td></td>
</tr>
<tr>
<td>Subjects</td>
<td></td>
</tr>
<tr>
<td>Testing Procedure</td>
<td></td>
</tr>
<tr>
<td>Scoring</td>
<td></td>
</tr>
<tr>
<td>Method of Analysis</td>
<td></td>
</tr>
<tr>
<td>Chapter III. The Results</td>
<td>31</td>
</tr>
<tr>
<td>Preliminary Analysis: Intercorrelation of Variables</td>
<td></td>
</tr>
<tr>
<td>Tests for Sex and Order Effects: The t-tests</td>
<td></td>
</tr>
<tr>
<td>Tests of the Hypothesis: The Analysis of Variance</td>
<td></td>
</tr>
<tr>
<td>Analysis for Further Clarification</td>
<td></td>
</tr>
<tr>
<td>Some Additional Analysis</td>
<td></td>
</tr>
<tr>
<td>Chapter IV. Discussion, Summary, and Suggestions for Future Research</td>
<td>48</td>
</tr>
<tr>
<td>Discussion</td>
<td></td>
</tr>
<tr>
<td>Summary</td>
<td></td>
</tr>
<tr>
<td>Suggestions for Future Research</td>
<td></td>
</tr>
<tr>
<td>References</td>
<td>56</td>
</tr>
<tr>
<td>Appendix A. Instructions for Brick Uses</td>
<td>61</td>
</tr>
<tr>
<td>Appendix B. Originality Rating Scale</td>
<td>62</td>
</tr>
<tr>
<td>Table</td>
<td>Description</td>
</tr>
<tr>
<td>-------</td>
<td>-------------</td>
</tr>
<tr>
<td>I</td>
<td>Review of Studies Finding Similar Traits in Field Independent and Creative Persons</td>
</tr>
<tr>
<td>II</td>
<td>Classification and Scoring of Variables</td>
</tr>
<tr>
<td>III</td>
<td>Correlational Matrix</td>
</tr>
<tr>
<td>IV</td>
<td>t-tests for Sex Differences</td>
</tr>
<tr>
<td>V</td>
<td>t-tests for Order Effects</td>
</tr>
<tr>
<td>VI</td>
<td>Standard Deviations and Means of RAS scores by HPT and GFC</td>
</tr>
<tr>
<td>VII</td>
<td>Analysis of Variance for CORIG, SIMI and QWT scores by ORDER, HPT, and GFC</td>
</tr>
<tr>
<td>VIII</td>
<td>Analysis of Covariance on QWT and SIMI scores by HPT and GFC with ORDER covaried</td>
</tr>
<tr>
<td>IX</td>
<td>Stepwise Regression on Corrected Originality scores</td>
</tr>
<tr>
<td>X</td>
<td>Stepwise Regression on SIMI scores</td>
</tr>
<tr>
<td>XI</td>
<td>Stepwise Regression on QWT scores</td>
</tr>
<tr>
<td>XII</td>
<td>Analysis of Covariance for SIMI scores by HPT, GFC, and CFLEX with ORDER covaried</td>
</tr>
<tr>
<td>XIII</td>
<td>Adjusted Means for SIMI scores by HPT and GFC</td>
</tr>
<tr>
<td>XIV</td>
<td>Analysis of Covariance for QWT by HPT, GFC, and CFLEX with ORDER covaried</td>
</tr>
<tr>
<td>XV</td>
<td>Adjusted Means for QWT scores by GFC and CFLEX</td>
</tr>
</tbody>
</table>
INTRODUCTION

In a society which has become as complex and problem laden as ours, the need for individuals who might provide innovative solutions to our problems becomes particularly great. This is not to suggest that creativity is something new. It is the playful, at times deadly manifestation of one of the most complex and perhaps distinctly human processes—innovative thought—and has been manifesting itself in one form or another for quite some time. For something that is so characteristic of human beings, it is poorly understood by the science which attempts the study of these elusive creatures. Creativity is undoubtedly the result of a complex process—one not easily broken down for more manageable examination. Yet, break it down we have, and must, to understand its internal structure.

Research in the field of creativity has revolved around three orientations: study of the products of creativity, the creative person, and the cognitive processes involved in the creative act. Needless to say, study of the products of creativity has proven to be a fascinating journey through the halls of past human accomplishment. But what of the people who create? Psychologists have spent a great deal of time and energy attempting to find out what the highly creative personality is like—its patterns of behavior, preferences and general characteristics.

The third orientation of research in this area, and the orientation of this paper, attempts to examine not the products of creativity or the creative individual, but the cognitive variables necessary for the creative process. It is the purpose of this paper
to demonstrate that the creative process might be better understood in terms of an interplay of various cognitive "styles"—some of which involve an orientation to the world which is more analytical, others which involve integrative perception. It should be noted that the question of a distinction between creativity and intelligence becomes irrelevant. A certain amount of intelligence is undoubtedly needed in the creative process. For the purposes of this paper, what is generally considered to be measured by tests of intelligence is merely the ability to operate in one particular cognitive style—a style which is necessary, along with others, in the creative process as well.
CHAPTER ONE
THE LITERATURE

The Early Conceptions

The cornerstone of the surge of interest in creativity witnessed during the 1950's may be found in J. P. Guilford's work (1957, 1959) concerning the structure of intellect. Guilford believed that the intellect could not be conceptualized as a unitary trait or uniform function, but rather as consisting of a large number of factors or primary mental abilities. Briefly stated, the intellect as described by Guilford is composed of memory and thinking. Thinking is in turn a combination of evaluation, cognition and production. Of these three aspects of thinking, production was considered by Guilford to be most important to the creative process.

Guilford sought to distinguish cognitive processes clearly related to intelligence versus those more directly concerned with creativity. Within the productive factor Guilford was able to distinguish what he labeled convergent versus divergent thinking processes. Convergent thinking is thought to entail a "zeroing in" upon one relatively uniquely determined "right" answer to the problem at hand. Divergent thinking is thought to entail a more free-wheeling search for material only loosely related to what is known. Guilford (1957) theorized that the processes involved in creative thinking could be most clearly characterized by divergent thinking.

From his analysis Guilford determined a number of subprocesses associated with divergent thinking. These subprocesses include a general sensitivity to the problems, as well as "associational fluency",...
"Expressional fluency", ideational fluency", "spontaneous flexibility" and "adaptive flexibility".

Briefly defined, associational fluency deals with the ability to produce as many synonyms as possible for a given word in a limited amount of time. Expressional fluency refers to the production of phrases or sentences within the requirements of a particular sentence structure. Ideational fluency involves the ability to produce ideas which fulfill certain requirements, such as uses for a brick. The ability to shift set and produce a great variety of ideas characterizes spontaneous flexibility. Such an ability would be demonstrated by the subject's ability to generate many different categories of uses for a brick. Adaptive flexibility involves the ability to solve problems which require methods of solution other than the conventional or obvious. Lastly, originality refers to the unusualness of response as gauged by low statistical frequency.

Convergent thinking has generally been thought to be largely what is tested by conventional intelligence tests, whereas divergent thinking is often equated with creativity. It becomes very important to remember in this regard that both convergent and divergent thinking are embedded within the productive thinking component of Guilford's conceptualization of the intellect. Guilford states: "We might arbitrarily define creative thinking as divergent thinking, but it would be incorrect to say that divergent thinking accounts for all the intellectual components of creative production." (Guilford, 1959)

Indeed, Guilford (1959) himself has questioned whether the components of creative talent might not be regarded as components of
intelligence, and whether they have any significant status among the intellectual abilities. In this regard, Thorndike (1963) found an average correlation among tests of convergent thinking to be .43, an average correlation among measures of divergent thinking to be .27, and an average correlation between the two sets of measures to be .24. From these data there does exist some evidence that measures of divergent thinking may not be clearly distinguishable from measures of intelligence. However, as Shoulksmith (1970) correctly notes, Guilford's divergent and convergent thinking processes should not be regarded as distinct and different entities. As Shoulksmith points out, that is not to say that they cannot be distinguished factorially, but that what is wrong, to quote Cropley (1966), is to assume that the creative process is "a separate basic intellective mode". Cropley shows that divergent and convergent thinking are partially interdependent—tests loading on the two orthogonal factors show a strong overlap.

As Shoulksmith points out, creativity tests as they have been developed from Guilford's original battery measure only one aspect of creativity—the "openness", "divergence" or global, free-wheeling side of creativity. It is very likely that analytical skills or thinking processes more generally regarded as convergent might be important as well as divergent thinking processes to the act of creativity.

Many researchers (Maltzman, Bogarty and Berger, 1958; Maltzman, Brooks, Bogarty and Summers 1958; Maltzman, Belloni and Fishbein, 1964) have taken a different approach to the problem of conceptualizing the creative process. First of all, Maltzman prefers to study "originality"
rather than "creativity" as he feels the latter is too burdened with the problem of social evaluation. (Arieti, 1976) "Original thinking" is defined by Maltzman as "behavior that occurs relatively infrequently, is uncommon under given conditions and is relevant to those conditions." (Maltzman et al. 1960, p. 1) Secondly, original thinking was thought by Maltzman to be the result of an associative process, and he was able to demonstrate that training sessions intended to increase an individual's ability to generate many associations to a given stimulus increased the number of statistically unique uses provided on Torrance's (1966) Unusual Uses Test. (Maltzman, 1960)

Maltzman's work is important in that it suggests that productivity of original responses may be influenced by experience and training. However, as Arieti (1976) correctly points out, the importance of Maltzman's work may be diminished somewhat if one views originality as a much simpler component of a larger creative process. The ability to produce many original responses to a particular problem may not be sufficient to actual creative production in the real world.

Maltzman's ideas provided the groundwork for Mednick's (1962) definition of creative thinking as "the bringing together of associative elements into new combinations which either meet specified criteria or are in some way useful". Mednick suggests that for every stimulus each individual possesses a repertoire of associations to that stimulus. The number of associations present in one's repertoire is considered by Mednick to be directly related to one's creative ability. Non-creative individuals are characterized as possessing a "steep" hierarchy of response. In other words, for these individuals,
a narrow range of stereotypical responses have more associational strength than more remote, original responses. Creative individuals, by contrast, are said by Mednick to possess "flat hierarchies" of response. In this situation, stereotypical responses do not have much more associational strength than more remote responses and therefore do not block the expression of such original responses.

To distinguish creative from non-creative individuals, Mednick has developed the Remote Associates Test. (Mednick, 1962) This test requires the individual to search through the response repertoires he holds for three seemingly unrelated words in search of their mediating link. For example, the correct mediating link for the three words "go", "poks" and "molasses" is "slow".

It is interesting to note that for successful performance on the RAT, the subject has to utilize two of what might be characterized as divergent thinking abilities: fluency and flexibility of response. Not only must the subject produce a large number of associations to each word, he must also demonstrate a flexibility of thinking by producing remote, perhaps infrequently made associations to each word.

However, in the RAT, yet another ability is utilized—that of integration. In this light, Arici (1976) likened the process of free association during psychoanalysis to the spontaneous association necessary in the creative process. However, as Arici points out, unless the patient—not the therapist—discovers the mediating link between his free associations, the client has not demonstrated creativity, but merely the ability to make associations.
In the RAT, as in "creative" psychoanalysis, there is first an analysis—an examination of the ingredients of the problem, followed by an integration of the similarities through the formation of the mediating link.

It is interesting to note that this formation of a mediating link is somewhat like convergent thinking in that it involves the search for the one correct answer to a problem. Perhaps the necessity of this ability to perform well on the RAT is one reason why authors such as Mednick (1963), Reimann (1964) and Laughlin (1967) have reported significant and sizeable correlations between the RAT and measures of general intelligence.

The Sequential Theories

Instead of conceptualizing the creative process in terms of a trait theory, as did Guilford, or as an associational process in the Waltman and Mednick tradition, a third orientation involves conceptualizing the creative process as proceeding in a linear fashion.

Wallas (1926) has suggested that the creative process progresses through the following stages: 1) Preparation, or the stage during which the problem is investigated in every direction by collecting data, listening to suggestions, and letting the mind wander. 2) Incubation, or the stage during which the problem is not given conscious attention. 3) Illumination, or the point at which the individual sees the solution to the problem. And, 4) verification, or the organization, refinement and implementation of the idea with the intention of its evaluation.
A second schema which is perhaps more applicable to what Taylor (1964) might label "inventive creativity", was posed by Rosman (1931) upon examining, by means of a questionnaire, the creative process in inventors. Rosman expanded Vallas' four stages into seven stages:

1) Observation of a need or difficulty
2) Analysis of the need
3) Survey of all available information
4) A formation of all objective solutions
5) A critical analysis of solutions for advantages and disadvantages
6) The birth of a new idea—Invention
7) Experimentation to test out the most promising solution and the selection and perfection of the final embodiment by some or all of the previous steps.

Osborn (1953) also felt that the creative process unfolded through seven steps, but his terminology is a bit more similar to that employed by Vallas:

1) Orientation: pointing up the problem
2) Preparation: gathering all pertinent data
3) Analysis: breaking down the relevant material
4) Ideation: piling up alternatives by way of ideas
5) Incubation: "letting up", to invite illumination
6) Synthesis: putting the pieces together
7) Evaluation: judging the resulting ideas

A less clearly delineated process is postulated by Wertheimer (1945) of the Gestalt school. According to Wertheimer, the creative
process involves a move from a structurally unstable or unsatisfactory situation (\(S\)) to a situation (\(S'\)) that offers a solution. This two-stage process involves a dividing of wholes into sub wholes and the visualization of different subwhole combinations without ever losing sight of the total gestalt. As the individual moves from \(S\) to \(S'\), a gap is filled, and a better gestalt is formed.

The interpretation of the creative process in terms of a progression through several stages is perhaps more an attempt by scientists to conceptualize creative thinking than an accurate description of the actual processes involved. It is doubtful that the creative process always unfolds in just such a manner. It is possible that in the course of the creative act all stages are occurring simultaneously or they are repeated several times. For instance, the individual may pass through the first two or three stages whereupon the idea being formulated is rejected and the entire process is begun again.

Vinacke (1952) is particularly critical of the sequential theories, and he questions whether they are applicable to all forms of creativity. It is possible that Rossman's Wallas' and Osborn's schemas might be more applicable to scientific, mathematical or "inventive" creativity, whereas Wertheimer's holistic conception may be more applicable to creativity in the arts.

Secondly, sequential theories are merely taxonomic. Aretti (1967) justifiably states that we cannot be satisfied with distinguishing and labeling phases, but we must intimately understand what goes on internally in such phases. Indeed, the various phases of the
sequential theories have yet to be operationalized in the same manner
that Guilford and Mednick have attempted to develop measures from
their theories.

The Nature of the Creative Process

If there is one common conclusion which can be drawn from the
various interpretations of the creative process which have been
explored thus far, it might be that creativity is far from a unitary
process but is very much a multi-dimensional affair. In each model
examined there initially seems to be a global orientation to the
problem, then an analysis of its elements, followed by a synthesis
or integration in the form of a solution or product. In Guilford's
model of productive thinking, this process takes the form of an
interplay of divergent and convergent thought processes. Mednick's
Remote Associates Test calls upon the subject to free associate and
then form a mediating link. Wertheimer's description involves a
delineation and recombination of sub wholes followed by the formation
of a new gestalt. The sequential theories of Wallas, Osborn and
Rossman all involve some form of analysis and synthesis.

Thus, all the models of creativity here reviewed seem to suggest
the operation of at least two if not several different cognitive
"styles" through the course of the creative act. In a similar fashion,
Bloomberg (1967) believes that:

A creative person must adopt an analytic orientation in order
in order to capture attributes of the whole problem which
cannot be dissected, retrieve elements previously sacrificed
and restructure them in an original, socially useful and
elegant fashion.

Barron (1955) claims that "the ability to synthesize...
complexity is the mark of the creative individual". Along the same
lines as Bloomberg, Crutchfield (1961) suggests that at "the very
core of the creative process lies the necessity for the combining or
recombining or transforming of the cognitive elements of the problem
in a novel and adaptive way". From a slightly different theoretical
orientation Kris (1952) suggests that the use of primary processes
during the creative act involves a "regression in service of the ego".

In this same vein, Wild (1965) presents evidence that creativity
necessitates utilizing psychological processes of several different
developmental levels. Lastly, Wallach and Kogan (1965) write that
at certain times their creative subjects demonstrated an ability to
switch from an open, free associative method of thinking to a highly
directed and perseverative thinking mode.

Now that an attempt has been made to understand the nature of
the creative process, it becomes necessary to examine the development
of what is termed "cognitive style" before an attempt is made to
examine the relationship between these two areas of inquiry.

The Development of Cognitive Style

Carret (1946) posited a differentiation hypothesis in an attempt
to conceptualize a developmental theory of intelligence. Briefly
stated, abstract or symbol intelligence is thought to change its
organization from a fairly unified and general ability to a loosely
organized group of abilities or factors.

Witkin (1967) suggested that evidence of psychological differ-
entiation could be utilized to conceptualize the perceptual changes
which he had observed in his longitudinal data on cognitive style.
The concept of cognitive style, or the manner in which the individual
perceives and organizes his or her environment can be traced to
Witkin's development of the field independent--field dependent
dimension.

Witkin (1962) states:

We found two decades ago that people differ in the way they
orient themselves in space. The way each person orients
himself is an expression of his preferred mode of perceiving
that is linked to many areas of functioning. Field dependent
persons find it difficult to overcome the influence of the
surrounding field, or to separate an item from its context.
(p. 22)

In other words, the field independent individual possesses a
greater ability to differentiate self from the external world,
whereas the field dependent has difficulty articulating self from the
external environment: the field dependent's perception of the world
is as yet somewhat global. It is important to note that this degree
of perceptual differentiation is thought to extend to other cognitive
processes as well.

Witkin originally operationalized his field independence--
dependence dimension with the use of a "tilting room, tilting chair"
apparatus, but other measures such as the Rod and Frame Test and the
Embedded Figures Test have been developed by Witkin to tap the
dimension.
Witkin's (1967) longitudinal data concerning the development of cognitive style provides evidence of a tendency for children to become less field dependent with age—as measured by the Rod and Frame Test. Witkin views this decrease in field dependence, or selective attention, as paralleling general psychological differentiation.

Werner (1957) describes a sequence of events in perceptual development similar to Witkin's notions of increasing differentiation, but his theory seems to go one step further:

Perception is first global; whole qualities are dominant. The next stage might be called analytic; perception is selectively directed toward parts. The final stage might be called synthetic; parts become integrated with respect to the whole. (p. 129)

Instead of an increasing tendency to become more analytical in style as Witkin suggests, a new style—synthesis of perception—emerges within the Wernerian system. Indeed, if we closely examine Witkin's longitudinal data, we find a peak in field independence occurring at approximately seventeen years of age. After this point in the developmental process, a slight drop in field independence is detected, followed by a relatively stable level of functioning maintained throughout adulthood.

Werner also states:

All higher organisms manifest a certain range of genetically different operations...Furthermore...the mature individual has at his disposal a greater number of developmentally different operations. (p. 130)

\Since Witkin's measures of field independence and field dependence are unidimensional—as are many other cognitive styles measures—
there has been a tendency in the literature to peg an individual as possessing but one cognitive style or another. It may be possible as Werner's theory suggests, for the mature individual to possess the ability to operate in a "field dependent" or more global fashion as well as a field independent, or more analytical style depending upon task demands.

Davis (1970), in an investigation of the developmental aspects of cognitive style, as measured by Siegel's conceptual style test, was surprised to find that older subjects in his sample did not manifest a preferred style; one which was manifested at least 50% of the time. In fact, less than one third of his subjects could be so classified, and they were the youngest individuals in his sample. Instead of moving from developmentally "primitive" descriptive-global styles, to developmentally "sophisticated" categorical-inferential responses, developing children increased their frequency of response in all style categories.

We have seen that Werner postulates a stage of synthesizing ability after increasing differentiation, plus the notion of multiple operations at maturity. Yet, Werner defines a third independent dimension of fixity versus mobility:

Developmental stratification means that a person is structured into spheres of operations which differ in regard to developmental level. Still another aspect concerns the flexibility of a person to operate at different levels depending upon the requirements of the situation. (p. 142)

To support this notion of fixity-mobility, Werner cites Duncker's (1943) finding that successful problem solving depends not only upon
the ability to progress in new directions, but to regress to an earlier neglected point from which one may begin again. Werner felt that this ability to shift vertically between different modes of perception was an essential component of the creative process:

... in creative reorganization, psychological regression involves two kinds of operations; one is de-differentiation (dissolution) of existing schematized or automatized behavior patterns; the other consists in the activation of primitive levels of behavior from which undifferentiated (little formulated) phenomena emerge. (p. 139)

Karonian and Sugerman (1967) feel that they have derived a measure of this kind of cognitive flexibility. They asked their S's to fixate on a Necker cube and to report the number of shifts in perspective experienced under two different conditions: a) allowing passive spontaneous shifts and b) attempting actively to resist shifts. It was felt that the first situation constituted a global, passive attitude, whereas the second situation required an active, analytical attitude. The ratio of passive to resistive scores constituted the measure of flexibility.

Karonian and Sugerman found that this measure of flexibility correlated negatively with field dependence as was logically expected. However, the relationship between field independence and fixity-mobility was not particularly strong—not all field independent S's demonstrated the ability to switch intentionally from a passive to a resistive attitude. Karonian and Sugerman conclude that field independence is not automatically associated with mobility; such flexibility is apparently a quality in its own right. So, it seems that we may have found yet another cognitive style independent of
analysis within the nature individual's styles repertoire.

As mentioned earlier, Guilford's (1959) notion of spontaneous flexibility is usually defined by the number of category switches made by an individual among uses for a common object, such as a brick. However, Guilford suggested that spontaneously flexible thinkers would see rapid fluctuations in ambiguous figures, such as the Necker cube or the staircase figure. It may be that Haronian and Sugarman's measure is just another measure of spontaneous flexibility across a horizontal décalage of functioning. Whether Haronian and Sugarman's measure actually reflects a flexibility between developmentally different levels of operation is still uncertain.

Now that we have seen the possibility of a multilinear development of several different cognitive styles, it becomes necessary to explore the relationship between the creative process and cognitive style.

The Relationship Between Creativity and Cognitive Style

Gallagher (1964) has gone so far as to equate one particular cognitive style--field independence--with creativity. After a careful examination of our present models of the creative thinking process, this statement seems somewhat simple minded. None the less, as Table I documents, there is some evidence that field independent individuals possess some of the same personality traits as creatives.
<table>
<thead>
<tr>
<th>Trait</th>
<th>Field Independent</th>
<th>Creative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Conformity</td>
<td>Liston</td>
<td>Barron</td>
</tr>
<tr>
<td>High level of Incidental learning</td>
<td>Wickin</td>
<td>Grisswold &amp; Mendelssohn</td>
</tr>
<tr>
<td>Relative Lack of Repression</td>
<td>Wickin</td>
<td>Myden</td>
</tr>
<tr>
<td>Risk Taking</td>
<td>Kogan &amp; Wallach</td>
<td>Mackworth</td>
</tr>
<tr>
<td>Permissive Parents</td>
<td>Dyk &amp; Witkin</td>
<td>Getzels &amp; Jackson</td>
</tr>
<tr>
<td>Low Identification with Mother</td>
<td>Vaught</td>
<td>Garwood</td>
</tr>
</tbody>
</table>

Data are from Bloomberg (1967).
Spotts and Mackler (1967) reported that field independent individuals consistently scored higher on tests of creativity than did field dependent individuals. Other studies (Bieri, Bradburn, and Galinsky 1958; Cotterels and Jackson, 1962; McWhinnie, 1967; and Ohnmacht and McMurtrie, 1971) yield generally inconclusive results, though they report a weak tendency for creatives to be field independent.

Bloomberg (1967, 1971) felt that the relationship between field independence and creativity might be clarified if Naronian and Sugarman’s (1967) fixity versus mobility dimension was taken into account. As mentioned earlier, Naronian and Sugarman found that not all field independent subjects possessed a mobility of response. Bloomberg suggested that those field independents who were mobile would be the creative field independents as well. If this is the case, the hazy relationship between field independence and creativity might be sharpened. Unfortunately, Bloomberg did not find his hypothesized relationships. Bloomberg’s field independent subjects who were also mobile were not the most creative as measured by the Revised Art Scale (Welsh, 1959), the Similes Preference Inventory (Pernon and Maddi, 1966) and the Creative Personality Scale (Trickey, 1963). In fact, there were as many creatives, as well as mobile subjects, among the field dependents as among the field independents.

It is difficult to know whether the measure of fixity versus mobility suggested by Naronian and Sugarman actually taps the dimension which Werner defines. Even if it is correctly operationalizing the dimension, it may only be reflecting a flexibility between
global and analytical styles. What of the ability to synthesize, to integrate one's perceptions into an organized whole? Let us more closely examine Werner's conception of this final stage of perceptual development and cognitive level of operation.

Werner cites work done by Friedman (1952), Phillips (1954), and their co-workers at Worcester State Hospital at Clark University concerning the development of a genetic scoring system for Rorschach responses:

...genetically low responses are those which indicate amorphous, diffuse or confabulatory percepts where little attention is given to part relations and to perception of contours. The genetically high percepts are reflected in the responses whereby the percept is that of a precisely formed unit with integrated parts, where the whole is composed of relatively independent sub-wholes brought together in an integrated fashion. (p. 141)

Werner cites Hommendinger's (1951) interesting finding that before the "genetically high" percepts described above are attained, the individual becomes preoccupied with small details of the figure.

At an earlier point in his discussion, Werner notes that before "hierarchization", that is the integration of cues within a problem solving situation, is to occur, this attention to detail, or what seems to be a more analytical response, is necessary.

Although Werner considers the synthesizing response developmentally superior, he suggests that some individuals who have attained a high level of abstract thought, but who have lost the ability to perform concrete tasks, are at a disadvantage. The most cognitively adaptive individual demonstrates a flexibility among various cognitive styles. However, we have seen that past attempts to
operationalize this ability seem questionable. It is possible that introduction of a different variable may better serve to clarify the field independence—creativity relationship.

Hypothesis to be Tested

The discussion presented thus far has provided some theoretical and empirical evidence which suggests that creativity is a multidimensional process rather than a unitary trait, and is possibly characterized by a micro-progression through various phases of cognitive functioning. Secondly, an examination of the development of cognitive style suggests that the developing individual progresses through a series of global, analytical and integrative styles, not unlike those suggested of the creative thinking process. However, it is also suggested that the development of these cognitive styles follows a multilinear rather than linear progression, therefore allowing the mature individual access not only to the most developmentally “advanced” style—that of synthesis—but to global and analytical styles as well.

This study will attempt to demonstrate that phases of the creative process might be better conceptualized in terms of two different cognitive styles—the tendency to analyze one’s perceptions and the tendency to integrate or synthesize one’s perceptions.

Past research has failed to clarify the hazy relationship between field independence—a more analytical style—and creativity. It is thought that instead of the fixity versus mobility dimension, the ability to integrate one’s perceptions might provide the missing link in the field independence—creativity relationship.
Three assumptions will be made. First, as the analytical and integrative cognitive styles will be operationalized in terms of perceptual tests, it is assumed that differentiation and integration of one's perception reflects a similar differentiation and integration of thought processes. Secondly, the tendency to analyze versus the tendency to integrate one's perceptions comprises two independent style dimensions. And, thirdly, the demonstration of the analytical and synthetic ability in one individual presupposes his or her ability to "flex" between these two styles.

Specifically, it is hypothesized that individuals who demonstrate a high analytical ability as well as a high ability to integrate their perceptions will be more creative than individuals who demonstrate a high level of competence on only one of the two style dimensions. Individuals who demonstrate low performance on each of the two style dimensions will obtain the lowest scores on measures of creativity.

Lastly, it is thought that this particular style combination will better characterize creative or productive thinking than what is traditionally labeled "intelligence".
CHAPTER TWO
THE PROCEDURE

The Measures:

To test the hypothesis outlined in Chapter 1, a research battery of six measures was assembled: (1) Hidden Figures Test, (2) The Gestalt Figure Completion Test, (3) Revised Art Scale, (4) The Similar Test, (5) Block Uses, and (6) The Quick Word Test. These measures will be described in detail below:

Hidden Figures Test

The first sixteen figures of the Hidden Figures Test developed by Mayrera and Jackson (1964) served as a measure of field-independence, or analytical ability. This adaptation for group administration of Witzkin's (1950) individually administered Embedded Figures Test requires the subject to locate model geometric figures within a larger, more complex, geometric field. This task requires an ability to focus on pertinent aspects of the embedded model while disregarding information within the field which has been constructed to be distracting to the subject. The subject must, in a sense, break down the preferred Gestalt in search of the hidden figure.

Gestalt Completion Test

The Gestalt Figure Completion Test used by Thurstone in his 1944 study of perception served as a measure of the subject's ability to synthesize material. Each of the 24 items on this measure consists of an incomplete black drawing on a white background. The
subject must quickly identify and briefly describe in writing the
subject of the picture.

The Gestalt Figure Completion Test requires the subject to
integrate seemingly disorganized, unrelated bits of information to
form a meaningful whole or gestalt. Kantor (1966) has suggested that
this perceptual ability reflects a more general conceptual ability
to grasp and unify a complex situation. Kantor reports a test--
retest reliability of .82 for the Gestalt Figure Completion Test.

Revised Art Scale

Three measures of creativity are included in the test battery.
The Revised Art Scale of the Welsh Figure Preference test, Welsh
(1959), does not require creative production from the subject, but
that he or she indicate his or her preference for simple symmetrical
versus complex asymmetrical figures. Gough (1961) found that the
more creative members of samples of physical scientists, architects,
research workers, artists, writers and doctoral candidates preferred
complex, asymmetrical figures, whereas the less creative members of
these samples preferred simple, symmetrical figures.

Similes Test

The Similes Test developed by Shaefer (1971) as an indicator
of literary talent served as a measure of verbal creativity. This
10 item test requires the subject to provide a maximum of three dif-
ferent original endings to such phrases as "The shell was as smooth
as...".
Brick Uses

Brick Uses, a test from the Guilford (1957) battery, served as a measure of inventive creativity. The subject is asked to list on a blank sheet of paper as many uses for a common red brick as he or she could conceptualize.

Quick Word Test

The Quick Word Test developed by Morgatta and Corsini (1964) served as a measure of general intellectual ability. The Quick Word Test is composed of 100 words for which four possible synonyms are given. The subject is asked to choose from these four words the one which best defines the item word. Eurea (1971) has reported evidence which suggests that this quick measure of intelligence correlates highly with more extensive batteries such as the WAIS.

Subjects

Subjects for this study were drawn from a pool of undergraduates taking the introductory course in psychology during the fall quarter of 1977 at the Ohio State University. 145 subjects, ranging from approximately 17 to 25 years of age were tested. The majority of subjects were from white middle class backgrounds. As a result, members of very poor or very wealthy families were probably not represented. Secondly, as native English was required, nationalities other than American were also not represented.

There were 61 males and 84 females in the original sample. To provide an equal number of males and females for the statistical analysis, 23 females were randomly eliminated from the sample. A
total of 112 subjects, 61 males and 61 females, comprised the final sample.

Testing Procedure

The data were collected in eight 90 minute sessions in which from 10 to 20 subjects were tested. During four sessions, tests were administered in the following order: the Revised Art Scale, Brick Uses and the Hidden Figures Test. Following a short break, the second set of tests was administered: the Gestalt Figure Completion Test, the Similes Test and the Quick Word Test. In the other four sessions, the before and after break sequences were switched in an attempt to counter balance effects due to order of test administration.

At the beginning of the experimental sessions, the experimenter introduced herself to the group. The subjects were reminded that the investigator was interested in the relationship between creativity and cognitive style, and that the session, including a short break, would take approximately 90 minutes of their time.

It was explained to the subjects that since they would not have to sign their names to the forms, the results of the study would remain completely confidential. Subjects were told they were free to ask questions or cancel the experiment at any time. Specific directions given to the subjects were those provided on the test forms. Directions for the Brick Uses Test are provided in Appendix A.

Scoring

Since the scoring for the Revised Art Scale, the Gestalt Figure Completion Test, the Hidden Figures Test and the Quick Word Test was
objective, these measures were scored by the experimenter. However, the Similar and Brick Uses data required a more subjective judgement, and were scored by two co-raters who had no knowledge of the hypothesized relationships.

The Revised Art Scale was scored as keyed in the manual. The score was the number of correct responses out of a possible 86. Gestalt Completion, the Hidden Figures Test and the Quick Word Test were scored simply in terms of the number of correct responses out of a possible 20, 16 and 100 respectively.

The Similar Test was scored by the co-raters according to the instructions provided in the manual. Each response was given a rating based on a 0 to 5 point scale. These individual scores were then summed across all 10 items to determine a total score out of a possible 150 points.

Brick Uses was scored for fluency, flexibility and originality of response, though the originality score was the only one of these three scores which was considered a measure of creativity. Before these scores were determined, nonsense responses, as well as any examples which the experimenter provided, were eliminated from the subject's list of uses. The fluency score was simply the number of responses given, the flexibility score, the number of shifts that the subject made from one response category to another.

A slight departure from Guilford's usual scoring of the Brick Uses Test was made in the determination of the originality score. Typically, originality is seen as merely the unusualness or remoteness of the response in a statistical sense. For instance, the originality score
could be the number of responses which occur less than 10% of the time.

For the purposes of this study, originality was seen as something more than the remoteness of response in a statistical sense. A zero to five point rating scale (see Appendix B) was developed by the experimenter to rate each response in terms of quality and cleverness of response, as well as utility of response. The sum of these individual ratings constituted the subject’s originality score.

Lastly, each subject’s originality and flexibility scores were “corrected for fluency”, (see Clark and Mirels, 1970) by dividing them by individual fluency scores. In this manner the gap is lessened between the subject who produces many moderately original responses and the subject who produces a few highly original responses. In the same manner the corrected flexibility score provides a better picture of the number of category shifts or “flexes” per response, versus the straight flexibility score which does not take into consideration length of the subject’s list of responses.

Method of Analysis

Preliminary analysis included the construction of a correlational matrix including all variables and the determination of inter-rater reliability coefficients for the Similes and Brick Uses data.

Before the hypothesized interactions could be examined, preliminary analysis exploring effects due to sex of the subject and order of test administration had to be determined. A series of t-tests for sex of the subject and order of test administration were performed on all variables.

Results from the correlational matrix which would support the
hypothesis would include moderate relationships between the cognitive style and creativity measures, no relationship between the two cognitive style variables, and low or no relationships between the creativity measures and the Quick Word Test.

Median splits were performed on all dependent variables to determine cell classification for the series of two and three way analyses of variance to follow. These analyses were specifically designed to test the hypothesis. Results which would support the hypothesis include for each of the creativity measures a significant interaction of the two cognitive style variables.

Stepwise regressions were run for each of the creativity measures and the Quick Word Test to further clarify results. Results from this analysis which would lend support to the hypothesis would include a large amount of the variance accounted for by the interaction of the cognitive style variables, although significant effects for each of the cognitive style variables would be suggestive as well.
Twelve variables collected from 122 subjects provided the data to be analyzed. Classifications of data scoring keys and abbreviations of variables used in Chapter III are presented in Table II.

**Preliminary Analysis: Intercorrelation of Variables**

Inter-rater reliability coefficients were computed for the Similes and Brick Uses data: Similes, $r = .81$, flexibility, $r = .84$, originality, $r = .84$, and fluency, $r = .87$.

Prior to analysis specifically designed to test the hypothesis in question, an intercorrelation matrix was constructed to present an overall picture of relationships among the data. The inter-correlations are presented in Table III. There does not appear in the correlational matrix to be strong support for the hypothesis. For instance, the Similes Test is the only measure of creativity which correlates significantly with both cognitive style variables: $r = .22$, $p < .05$ with Hidden Figures and $r = .29$, $p < .001$ with Gestalt Figure Completion. Corrected originality in turn correlates with Gestalt Figure Completion, $r = .18$, $p < .05$, but not with Hidden Figures. The Revised Art Scale scores demonstrate little or no relationship with either of the cognitive style variables.

Secondly, the assumption that Gestalt Figure Completion and Hidden Figures reflect independent style dimensions is challenged by the .37 correlation between these two variables.
<table>
<thead>
<tr>
<th>No.</th>
<th>Variable</th>
<th>Abbreviation</th>
<th>Scoring (high score)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Hidden Figures Test</td>
<td>HFT</td>
<td>No. correct</td>
</tr>
<tr>
<td>2</td>
<td>Gestalt Completion</td>
<td>GFC</td>
<td>No. correct</td>
</tr>
<tr>
<td>3</td>
<td>Revised Art Scale</td>
<td>RAS</td>
<td>No. correct</td>
</tr>
<tr>
<td>4</td>
<td>Similarities Test</td>
<td>SIMI</td>
<td>Total score</td>
</tr>
<tr>
<td>5</td>
<td>Brick Uses Fluency</td>
<td>FLUE</td>
<td>No. of responses</td>
</tr>
<tr>
<td>6</td>
<td>Brick Uses Flexibility</td>
<td>FLEX</td>
<td>No. of shifts</td>
</tr>
<tr>
<td>7</td>
<td>Corrected Flexibility</td>
<td>CFX</td>
<td>No. of shifts/fluency</td>
</tr>
<tr>
<td>8</td>
<td>Brick Uses Originality</td>
<td>ORIG</td>
<td>Total score</td>
</tr>
<tr>
<td>9</td>
<td>Corrected Originality</td>
<td>CORIG</td>
<td>Total score/fluency</td>
</tr>
<tr>
<td>10</td>
<td>Quick Word Test</td>
<td>QWT</td>
<td>No. correct</td>
</tr>
<tr>
<td>11</td>
<td>Sex</td>
<td>SEX</td>
<td>Female</td>
</tr>
<tr>
<td>12</td>
<td>Order*</td>
<td>ORD</td>
<td>2nd order</td>
</tr>
<tr>
<td>13</td>
<td>Interaction of Cognitive Style Variables</td>
<td>GFT*HFT</td>
<td>Multiplication of Cognitive Style Variables</td>
</tr>
</tbody>
</table>

* 1st order: GFT SIMI QWT break RAS BU HFT
  2nd order: RAS BU HFT break GFC SIMI QWT
<table>
<thead>
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<th>4</th>
<th>5</th>
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<td>.16</td>
<td>-.12</td>
<td>.29</td>
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<td>.12</td>
<td>.21</td>
<td>-.97</td>
<td>.36</td>
<td>.85</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>-.02</td>
<td></td>
<td>.10</td>
<td>.14</td>
<td>-.09</td>
<td>.36</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>8</td>
<td>.13</td>
<td>.24</td>
<td>.02</td>
<td>.30</td>
<td>.75</td>
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<td>.30</td>
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<tr>
<td>9</td>
<td>.01</td>
<td>.18</td>
<td>.20</td>
<td>.13</td>
<td>.04</td>
<td>.35</td>
<td>.56</td>
<td>.65</td>
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<tr>
<td>10</td>
<td>.21</td>
<td>.19</td>
<td>-.01</td>
<td>.10</td>
<td>-.01</td>
<td>-.08</td>
<td>-.10</td>
<td>-.05</td>
<td>-.08</td>
<td></td>
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<tr>
<td>11</td>
<td>.12</td>
<td></td>
<td>-.01</td>
<td>.04</td>
<td>-.18</td>
<td>-.20</td>
<td>-.14</td>
<td>-.15</td>
<td>.16</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>12</td>
<td>.12</td>
<td></td>
<td>-.34</td>
<td>.15</td>
<td>-.01</td>
<td>-.07</td>
<td>-.03</td>
<td>-.27</td>
<td>-.42</td>
<td>.25</td>
<td>.00</td>
<td></td>
</tr>
</tbody>
</table>

* p < .05
** p < .01
*** p < .001

Legend:
1) HIP
2) GPC
3) RAS
4) SIMA
5) FLUE
6) FLEX
7) CPF
8) ORIG
9) CORIG
10) INT
11) SEX
12) CRD
There is some support for the notion that creative ability is distinct from general intelligence. The relationships between the Quick Word Test, the measure of general intelligence, and the creativity scores were, with one exception, consistently negative and quite low. The Similes Test scores demonstrated a .00 correlation with the Quick Word Test scores, but this relationship was, of course, not significant. There were, however, significant, though moderate, relationships between both cognitive style measures and intelligence. The correlation coefficients for Hidden Figures and Gestalt Figure Completion with Quick Word Test scores were .21, p<.05, and .19, p<.05 respectively.

There is only moderate support for the notion that the creativity measures used here all tap an underlying creative ability. Inter-correlations among the Brick Uses subscores were quite high. However, after corrections for fluency were made, these correlations, though remaining significant, demonstrated a considerable drop. The relationships between the Similes Test scores and originality and flexibility subscores are significant prior to corrections for fluency, but after corrections were made, these relationships dropped below significance levels, hence suggesting that the .29 correlation between fluency and the Similes scores is the stronger relationship.

The Revised Art Scale demonstrates virtually no relationship with the other creativity measures, with the exception of a .20, p<.01 correlation with corrected originality. It is interesting to note that this relationship was not present with the uncorrected originality score, probably due to the -.12 correlation between fluency and the
Revised Art Scale.

Several other interesting relationships which do not directly pertain to the hypothesis are suggested by the correlational matrix. For instance, males demonstrate higher scores on the fluency, flexibility and originality subscores of the Brick Uses Test as reflected by the significant negative correlations of these subscores with sex. It is important to note however, that these relationships drop below significance levels when flexibility and originality scores are "corrected for fluency". There seem to be no other significant relationships between the male-female domain and independent or dependent variables.

Order of test administration generally appears to be exerting little effect except with the originality and corrected originality scores of the Brick Uses Test and the Quick Word Test. Pearson product moment correlation coefficients with these variables were $r = -.27$, $p < .01$, $r = -.42$, $p < .001$ and $r = .25$, $p < .01$, respectively.

Tests for Sex and Order Effects: The t-tests

Prior to the analyses of variance, t-tests were performed on all independent and dependent variables to determine the effects of order of test administration and sex differences. Results of t-tests for sex differences are presented in Table IV.
Table IV

$t$-tests for sex differences

<table>
<thead>
<tr>
<th>Variable</th>
<th>$t$</th>
</tr>
</thead>
<tbody>
<tr>
<td>STR</td>
<td>1.38</td>
</tr>
<tr>
<td>GFC</td>
<td>.02</td>
</tr>
<tr>
<td>QMT</td>
<td>1.73</td>
</tr>
<tr>
<td>FLMC</td>
<td>1.99*</td>
</tr>
<tr>
<td>FLEX</td>
<td>2.21*</td>
</tr>
<tr>
<td>CFLEX</td>
<td>1.50</td>
</tr>
<tr>
<td>ORIG</td>
<td>2.22*</td>
</tr>
<tr>
<td>CORIG</td>
<td>1.65</td>
</tr>
<tr>
<td>RAS</td>
<td>.13</td>
</tr>
<tr>
<td>STMI</td>
<td>.46</td>
</tr>
</tbody>
</table>

* $p < .05$

As can be seen, Table IV generally reflects the sex differences suggested by the correlational matrix. Sex differences observed in flexibility and originality scores drop out after they have been corrected for fluency. The fluency score is the only variable which demonstrates a significant sex difference, with males being slightly more fluent than females - as reflected by their respective 11.85 and 10.57 means.

The results of $t$-tests for order effects may be found in Table V:
Table V

t-tests for order effects

<table>
<thead>
<tr>
<th>Variable</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>HFT</td>
<td>1.33</td>
</tr>
<tr>
<td>GFC</td>
<td>.04</td>
</tr>
<tr>
<td>GMT</td>
<td>2.69**</td>
</tr>
<tr>
<td>FLIN</td>
<td>.12</td>
</tr>
<tr>
<td>FLEX</td>
<td>.73</td>
</tr>
<tr>
<td>CFLEX</td>
<td>.31</td>
</tr>
<tr>
<td>ORIG</td>
<td>3.15**</td>
</tr>
<tr>
<td>CORTG</td>
<td>5.26**</td>
</tr>
<tr>
<td>RAS</td>
<td>1.49</td>
</tr>
<tr>
<td>SIMI</td>
<td>1.89</td>
</tr>
</tbody>
</table>

* p < .05
** p < .01

The results presented in Table V reflect results presented earlier in the correlation matrix. Both uncorrected and corrected originality scores, as well as the Quick Word Test are affected by order of test administration. It is interesting to note that for all three measures the "after break" mean is the higher mean. The means for the Quick Word Test are 38 before break and 45 after break; for originality, 16.57 before break and 21.32 after break; for corrected originality, 1.47 before break and 1.87 after break.

It is important to note that the t value for the Similes data, 1.89, approaches significance, p < .06. The before and after break means for this variable were 67 and 72 respectively.

Tests of the Hypothesis: The Analysis of Variance

Median splits were performed on the Hidden Figures Test and
Gestalt Figure Completion scores to provide two levels of two independent variables for an analysis of variance on the three measures of creativity, and the Quick Word Test. Then, depending upon whether or not sex differences or order effects had to be taken into consideration, 2 or 3 way analyses of variance and, where appropriate, analyses of covariance, were computed for each of the creativity measures and the Quick Word Test. For clarity of presentation, each dependent variable will be examined separately.

The means and standard deviations from a 2 x 2 analysis of variance on the Revised Art Scale scores appear in Table VI below:

Table VI
Means and Standard Deviations of RAS scores by HPT and GFC

<table>
<thead>
<tr>
<th></th>
<th>High HPT</th>
<th>Low HPT</th>
</tr>
</thead>
<tbody>
<tr>
<td>High GPC Mean</td>
<td>51.13</td>
<td>47.22</td>
</tr>
<tr>
<td>S.D.</td>
<td>16.16</td>
<td>21.13</td>
</tr>
<tr>
<td>Low GPC Mean</td>
<td>44.81</td>
<td>52.35</td>
</tr>
<tr>
<td>S.D.</td>
<td>18.33</td>
<td>21.24</td>
</tr>
</tbody>
</table>

Examination of Table VI suggests an interaction of the cognitive style variables. However, it is the low HPT, low GPC cell mean, rather than the high HPT, high GPC cell mean which is the larger of the two. This unpredicted finding did not reach significance,
\[ F = 2.63, \ p < .11, \ df = 1, 118, \] nor were either of the main effects significant.

As the preliminary analysis indicated that the corrected originality, Similes and Quick Word Test scores were being affected by order of test administration, a 2 x 2 x 2 analysis of variance including order and the cognitive style variables in the matrix was made of each of these dependent variables. The results of this analysis are presented in Table VII below:

<table>
<thead>
<tr>
<th>Variable</th>
<th>CORIG F</th>
<th>SIMI F</th>
<th>QNT F</th>
</tr>
</thead>
<tbody>
<tr>
<td>ORDER</td>
<td>24.46**</td>
<td>3.08</td>
<td>7.61**</td>
</tr>
<tr>
<td>HFT</td>
<td>1.01</td>
<td>3.08</td>
<td>2.20</td>
</tr>
<tr>
<td>GFC</td>
<td>.01</td>
<td>1.58</td>
<td>3.14</td>
</tr>
<tr>
<td>ORDER x HFT</td>
<td>.25</td>
<td>1.05</td>
<td>.05</td>
</tr>
<tr>
<td>ORDER x GFC</td>
<td>.86</td>
<td>.17</td>
<td>.12</td>
</tr>
<tr>
<td>HFT x GFC</td>
<td>1.48</td>
<td>1.71</td>
<td>2.16</td>
</tr>
<tr>
<td>ORDER x HFT x GFC</td>
<td>.14</td>
<td>.54</td>
<td>.45</td>
</tr>
</tbody>
</table>

***p < .01
###p < .001

As can be seen, the only significant F ratios in these three
analyses reflected the strong effect of order of test administration had on the corrected originality score, $F = 24.46, p < .0001, df = 7, 114$, and Quick Word Test, $F = 7.61, p < .01, df = 1, 114$. The effect of order on the Similes scores approached significance, $F = 3.08, p < .06, df = 7, 114$. The effect of the integrative style, GPC, on the Quick Word Test also approached significance, $F = 3.14, p < .08, df = 1, 114$.

A $2 \times 2$ analysis of covariance was run on the Similes and Quick Word Test data with order of test administration as the covariate. The results of this analysis are presented in Table VIII below:

<table>
<thead>
<tr>
<th>Variable</th>
<th>SIMI</th>
<th>QWT</th>
</tr>
</thead>
<tbody>
<tr>
<td>NFT</td>
<td>3.87*</td>
<td>2.85</td>
</tr>
<tr>
<td>GFT</td>
<td>1.42</td>
<td>2.63</td>
</tr>
<tr>
<td>GFT x NFT</td>
<td>1.62</td>
<td>1.81</td>
</tr>
<tr>
<td>ORDER</td>
<td>2.91</td>
<td>7.31**</td>
</tr>
</tbody>
</table>

* $p < .05$
** $p < .01$

It appears that when order is held constant, the analytical style, NFT, may be exerting an effect on Similes performance, $F = 3.87, p < .05, df = 1, 117$. To ensure the validity of this finding, a test
of homogeneity of regression was conducted. The interaction of
order and the Hidden Figures Test was not significant, $F = 1.05$,
$p < .31$, df = 1, 117. Therefore it appears that the assumption of
common slope for both comparison groups can be made. The only
significant $F$ ratio for the Quick Word Test data was for the covariate,
$F = 7.31$, $p < .01$, df = 1, 117.

Analysis for Further Clarification: The Stepwise Regressions

Stepwise Regressions were performed for all five measures of
divergent thinking and the intelligence measure. In each case,
the Hidden Figures Test, Gestalt Figure Completion, and the inter-
action of these two variables, HFT*GPC, was entered into the model, as
well as sex of the subject and order of test administration. The
fluency and corrected flexibility scores from the Brick Uses Test
were included in the Similes, Quick Word Test and Revised Art Scale
equations.

The results of a stepwise regression on the corrected originality
scores is presented in Table IX below:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Cum. % of Variance</th>
<th>$F$</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>ORDER</td>
<td>18</td>
<td>26.70</td>
<td>.001</td>
</tr>
<tr>
<td>GPC</td>
<td>21</td>
<td>4.90</td>
<td>.03</td>
</tr>
<tr>
<td>SEX</td>
<td>23</td>
<td>3.39</td>
<td>.07</td>
</tr>
</tbody>
</table>
As reflected in earlier analyses, order of test administration is accounting for the majority of the variance in the corrected originality scores, $F = 26.70, p < .001, df = 1, 118$. It appears that when the data are observed on a continuous scale, the integrative style, CFC, seems to be exerting some effect as well. The predicted GFC*HFT interaction was not significant, nor were the analytical style, HFT, or sex of the subject variables.

The results of the stepwise regression on the Similes scores are presented in Table X below:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Cum. X of Variance</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>GFC</td>
<td>08</td>
<td>8.64</td>
<td>.004</td>
</tr>
<tr>
<td>FLUE</td>
<td>14</td>
<td>8.46</td>
<td>.004</td>
</tr>
<tr>
<td>ORDER</td>
<td>17</td>
<td>4.03</td>
<td>.05</td>
</tr>
</tbody>
</table>

The table above suggests that Gombrich Figure Completion is the best predictor of Similes, $F = 8.64, p < .004, df = 1, 118$, with fluency of response exerting a significant effect as well, $F = 8.46, p < .004, df = 1, 118$. These findings are interesting in light of the analysis of covariance results which suggest a main effect of HFT on the Similes scores. This apparent contradiction will be discussed in Chapter IV. As reflected in earlier analyses, order of test
administration is significant, $F = 4.83, p < .05, df = 1, 118$.

The stepwise regression performed on the RAS data revealed no significant findings. Order of test administration was the best predictor, $F = 2.22, p < .14, df = 1, 120$, but accounted for only 1% of the variance.

The results of the stepwise regression on the Quick Word Test scores are presented in Table XI:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Cum. % of Variance</th>
<th>$F$</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>ORDER</td>
<td>0.6</td>
<td>7.45</td>
<td>.01</td>
</tr>
<tr>
<td>CFQ/CMT</td>
<td>11</td>
<td>4.98</td>
<td>.03</td>
</tr>
<tr>
<td>SEX</td>
<td>12</td>
<td>2.41</td>
<td>.12</td>
</tr>
</tbody>
</table>

The effects of order of test administration are reflecting earlier results, $F = 7.45, p < .01, df = 1, 118$. The interaction of the two cognitive style variables is exerting a significant effect as well, $F = 4.98, p < .01, df = 1, 118$. This finding is interesting as it was predicted for the creativity scores—not the general intelligence measure. More discussion of this unpredicted result will follow in Chapter IV.

**Some Additional Analysis**

Since Bloomberg (1971) suggested that mobility of response
was related to creativity, several additional analyses of variance and covariance which included the flexibility score from the Brick Uses Test as a main effect were performed on the Similes and Revised Art Scale data.

The results of an analysis of covariance performed on the Similes Test data including both cognitive style variables and the corrected flexibility measure in the matrix are presented in Table XII below:

Table XII
Analysis of covariance for Sim scores by NFT, GFC and CFLEX with ORDER

<table>
<thead>
<tr>
<th>Variable</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>NFT</td>
<td>5.19*</td>
</tr>
<tr>
<td>GFC</td>
<td>1.30</td>
</tr>
<tr>
<td>CFLEX</td>
<td>8.62**</td>
</tr>
<tr>
<td>NFT x GFC</td>
<td>3.86*</td>
</tr>
<tr>
<td>NFT x CFLEX</td>
<td>.16</td>
</tr>
<tr>
<td>GFC x CFLEX</td>
<td>.83</td>
</tr>
<tr>
<td>NFT x GFC x CFLEX</td>
<td>.02</td>
</tr>
<tr>
<td>ORDER</td>
<td>4.32*</td>
</tr>
</tbody>
</table>

* p < .05
** p < .01

There appears to be a significant effect due to NFT, $F = 5.19$, $p < .05$, df = 1, 113. This finding is consistent with the earlier
analysis of covariance performed on the Sfmiles data, however
as additional variable, corrected flexibility, is also exercising
an effect, $F = 8.62$, $p < .01$, $df = 1, 113$. More importantly, there
now appears to be a significant interaction between the two cognitive
style measures, $F = 3.80$, $p < .05$, $df = 1, 113$. The adjusted means
which reveal the source of this significant effect are presented in
Table XIII below:

Table XIII
Adjusted Means for Smiles scores
by HFT and GFT

<table>
<thead>
<tr>
<th></th>
<th>High HFT</th>
<th>Low HFT</th>
</tr>
</thead>
<tbody>
<tr>
<td>High GFC</td>
<td>75.39</td>
<td>67.23</td>
</tr>
<tr>
<td>Low GFC</td>
<td>69.26</td>
<td>67.73</td>
</tr>
</tbody>
</table>

From Table XIII it appears that the individual who scores
highly on both cognitive style measures is more creative than the
individual who scores highly on just one style measure. This is
a predicted result.

To insure the validity of the significant findings from the
analysis of covariance reported above, a test for homogeneity of
regression was performed. None of the main effects demonstrated a
significant interaction with the covariate: HFT x ORDER, $F = .57$,
$p > .05$; CPLEX x ORDER, $F = .71$, $p > .05$; HFT x GPC x ORDER, $F = .94$,
$p > .05$. 
An analysis of variance performed on the Revised Art Scale scores including both cognitive style measures and flexibility of response as main effects revealed no significant results. However, the interaction of the cognitive style variables approached significance, F = 3.14, p < .08 as is consistent with the trend reported in the analysis of variance performed earlier.

Lastly, an analysis of covariance which included flexibility of response as a third main effect was performed on the Quick Word Test scores. The results of this analysis may be found in Table XIV below:

<table>
<thead>
<tr>
<th>Variable</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>HFT</td>
<td>.99</td>
</tr>
<tr>
<td>GFC</td>
<td>4.22*</td>
</tr>
<tr>
<td>CFLEX</td>
<td>.54</td>
</tr>
<tr>
<td>HFT x GFC</td>
<td>.98</td>
</tr>
<tr>
<td>HFT x CFLEX</td>
<td>.77</td>
</tr>
<tr>
<td>GFC x CFLEX</td>
<td>5.87*</td>
</tr>
<tr>
<td>HFT x GFC x CFLEX</td>
<td>1.07</td>
</tr>
<tr>
<td>ORDER</td>
<td>6.95*</td>
</tr>
</tbody>
</table>

*p < .05
**p < .01
As can be seen in Table XIV the integrative style, GFC, seems to be exerting a main effect, \( F = 4.22, p < .05, df = 1, 113 \). However the interaction of this variable with corrected flexibility of response is also significant, \( F = 5.87, p < .05, df = 1, 113 \). As is consistent with earlier analyses, the covariate is exerting a significant effect, \( F = 6.95, p < .05, df = 1, 113 \). The tests for homogeneity of regression revealed no significant results: \( GFC \times ORDER, F = .68, p > .05 \), \( GFC \times CFLEX \times ORDER, F = 1.04, p > .05 \).

The source of the interaction between the CFLEX and GFC variables may be found in Table XV below:

Table XV
Adjusted means for QNT scores by GFC and CFLEX

<table>
<thead>
<tr>
<th></th>
<th>high GFC</th>
<th>low GFC</th>
</tr>
</thead>
<tbody>
<tr>
<td>high CFLEX</td>
<td>41.24</td>
<td>41.18</td>
</tr>
<tr>
<td>low CFLEX</td>
<td>48.16</td>
<td>38.06</td>
</tr>
</tbody>
</table>

Interestingly, it is the individual who scores high on the integrative style, GFC, but low on the measure of flexibility of response who demonstrates the highest Quick Word Test score. This curious result as well as others presented thus far will be discussed in Chapter IV.
Discussion

The results presented in the previous chapter are somewhat ambiguous and, at times, seemingly contradictory, consequently, interpretation of them will be cautious. Before considering the hypothesis in question, a brief discussion should be made of some of the findings from the preliminary analysis.

The failure to demonstrate sex differences on either of the cognitive style variables is not consistent with the long held notion, initially suggested by Witkin (1962) and unequivocally accepted by Baronian and Sugerman (1967), that males are more field independent than females.

Sex differences were also absent in the creativity scores, with the exception of the fluency score from the Brick Uses Test. This is also an unexpected finding as such authors as Barron (1969), Terman (1947), and Torrance (1963) have noted that males often demonstrate more creativity than females. It is possible that differential socialization of the sexes is responsible for past findings, and that the current trend to break down traditional childrearing practices may be one reason why sex differences in this area are disappearing.

It is interesting to note that for all the three measures which seemed to be affected by order of test administration, it was the "after break" mean which was the higher of the two means. The author had been somewhat concerned about effects of fatigue toward the end
of the rather long testing session. The results concerning order effects do not support this concern, but rather suggest the necessity for the subject to loosen up, to warm up before maximum performance can be attained on measures of both creativity and intelligence.

Initial examination of the various relationships among the variables does not provide magnified support for the thesis that individuals who score highly on both styles measures are more creative than those who score highly on only one style measure. The Similes Test was the only measure of creativity which correlated significantly with both cognitive style measures, and these correlations were rather low. It may be possible that the hypothesized interaction between the cognitive style variables is only applicable to certain kinds of creativity, in this particular case—literary creativity.

Perhaps the tenuous relationships between the cognitive style and creativity measures are partially due to the fact that the cognitive style measures were significantly related to one another. Although one might expect some relationship between these measures as they both involve perceptual ability, the assumption of two independent style dimensions may be questioned. Guilford (1959) was also unable to uncover in his data separate factors which would suggest a unitary ability to analyze versus a unitary ability to synthesize. Perhaps these abilities have not been adequately operationalized. It is possible that the ability to analyze and the ability to integrate or synthesize in the perceptual domain may not insure the ability to analyze or synthesize in the intellectual domain. On the other hand,
the cognitive style measures may simply both reflect general ability. There is some support for this notion as they both significantly related to the Quick Word Test. However, if one endorses the Spearman concept of "g", this finding may not be so upsetting. All intellectual skills will be related to general ability and at the same time retain enough independence to be considered separate abilities. At any rate, it becomes necessary to remember that the cognitive style measures are significantly related as interpretation of the results is made.

It is interesting to note that the Quick Word Test bore no relationship with any of the creativity measures. This lends some support for the notion that creative ability is somewhat distinct from general intelligence. However, as the standard deviation of the Quick Word Test scores was small and the mean at the 20th percentile of the normative population, the author suspects some restriction of range. If this is so, the likelihood of finding significant correlations between the creativity scores and the Quick Word Test is reduced, even when relatively strong relationships between these variables may actually exist.

Results from the analyses of variance which were originally planned do not support the presence of the hypothesized interaction between the two cognitive style variables. For instance, it is interesting to note that even though those who demonstrate low scores on both style dimensions had the highest Revised Art Scale mean, those who demonstrated high scores on both style dimensions also had higher than those who had a high score on only one style dimension.
This finding lends support for Clark's (1967) suggestion that a balance of cognitive skills is more important to complex functioning than high ability in just one cognitive skill.

An apparent contradiction appears in the Similes data when one examines the stepwise regression results. This analysis suggests that the ability to integrate one's perceptions is the best predictor of literary creativity, whereas the analysis of covariance suggests that the ability to analyze is more important. When a point biserial correlation was performed between the cognitive style means derived from the median splits and the Similes data, the analytical measure again became the significant predictor of creative ability, \( r = .22, p < .02 \). These findings suggest that when one examines individuals at the extremes of the style dimensions, analytical ability becomes more important to creative production whereas when the data are examined in a continuous fashion, the ability to integrate one's perceptions becomes important. However, this conclusion must remain tentative in light of the significant relationship between the two style variables.

The results of the stepwise regression performed on the Similes data also suggest that fluency and flexibility of response coupled with integrative ability may be more important predictors of creative ability than the interaction of the cognitive style variables.

Though the hypothesized interaction between the cognitive style variables was not present in the results of the originally planned analyses, it appeared in the Similes data when the flexibility scores
were added to the model as a main effect. As mentioned earlier, Bloomberg (1971) had hypothesized an interaction between flexibility or mobility of response and field independence as far as creative ability was concerned. Bloomberg's hypothesized interaction was not present in this post hoc analysis, though flexibility of response exerted a significant main effect.

The results of the post hoc analysis of the Quick Word Test scores did suggest an interaction of flexibility with one of the cognitive style variables—though not in the suspected direction. Furthermore, the style variable which flexibility interacted with was the Gestalt Figure Completion Test—the measure of integrative style. This finding seems a bit surprising, along with the significant main effect of Gestalt Figure Completion on the Quick Word Test scores. One might expect the Hidden Figures Test—the measure of analytical ability—to be most important to a measure of intelligence. Instead, this style variable demonstrated a main effect for the Similes data. Secondly, it seems that flexibility of thinking, though a significant main effect for the Similes data, might be detrimental to superior performance on the intelligence measure.

As mentioned earlier, the ability to integrate one's perceptions was considered by Werner (1957) to reflect the highest level of perceptual differentiation. When this theoretical notion is reconsidered, the fact that Gestalt Figure Completion (instead of the Hidden Figures Test) exerted a main effect on the Quick Word Test scores becomes more understandable.

Secondly, flexibility of thinking—which possibly reflects more
free-wheeling, divergent thinking processes—might actually get in
the way of adequate performance on measures of intelligence, whereas
it becomes quite important to creative thought processes. Support
for this possibility is found in the Similes data. However, whether
or not the flexibility variable used in this study specifically
reflects an ability to flex between integrative and analytical styles
is questionable.

Summary
Using Werner's (1957) ideas concerning perceptual development
as a theoretical base, this study sought to demonstrate that phases
of what was considered a multidimensional creative process might be
better conceptualized in terms of two different cognitive styles:
the tendency to integrate or synthesize one's perceptions versus the
tendency to analyze one's perceptions.

Several measures of creativity were used. These measures included
the Similes Test (Shaefer, 1971), the Revised Art Scale (Welsh, 1959)
and an Originality score from Guilford's (1951) Brick Uses Test.

The cognitive style dimensions were operationalized in terms of
two perceptual tests. The Hidden Figures Test (Meyers and Jackson,
1964) served as the measure of analytical style, Thurstone's (1944)
Gestalt Figure Completion Test served as the operational definition
of the integrative style. Lastly, the Quick Word Test (Borgatta and
Corsini, 1964) served as an indicator of general intellectual ability.

The results suggested that the hypothesized interaction of the
cognitive style variables was significantly related to Similes
performance when flexibility of response was also included in the
analysis. The analytical style exerted a main effect on the Similes data whereas the integrative style was related to the measure of general intelligence. The creativity measures did not seem to be related to intelligence.

A significant relationship between the two cognitive style variables throws some doubt on the assumption that they are independent style dimensions, and that makes interpretation of the results difficult. Lastly, a suspicion of a restriction of range for all variables may explain the relatively low relationships observed.

Suggestions for Future Research

Perhaps the major methodological problem with research in this area revolves around the lack of sound measures of creativity. It becomes difficult to formulate conclusions concerning the creative process when creativity is so poorly operationalized. One might suggest that all research in the area focus on the development of better measures of creativity before and attempt is made to explore relationships between creativity and other variables.

But for those of us who can not wait the length of time necessary to develop better measures of creativity, another alternative might be available. Instead of examining the general population, it is suggested that one explore the variables of interest in populations judged as creative versus those judged non-creative. For instance, it might be interesting to replicate this study using students designated by their major departments as creative, and compare their performance on the style variables with students who are equally proficient technically, but who are designated non-creative in
comparison.

Secondly, it is suggested that various types of creativity should be more carefully considered. It is possible that one style combination may be necessary for artistic creativity, whereas another might be more appropriate for creativity in the sciences.

It might be profitable to consider other methods of operationalizing the differentiative and integrative styles of perception and thinking. Instead of presenting tasks to the subject for which analytical versus integrative styles are deemed necessary, it might be possible to obtain some sort of indication of a person's stylistic preferences and abilities through a projective measure. Ames (1971) suggested that Rorschach ink blots may be sensitive to such stylistic differences. It would be interesting to see how scoring of this measure would relate to evidence of creative ability.

Lastly, the inability to demonstrate strong relationships between cognitive style variables and creative production may be the result of a failure to consider various personality characteristics. An individual may possess the cognitive abilities for creative production, but these abilities may never be utilized due to motivational or situational concerns. Indeed, the complex nature of this uniquely human activity—creative production—will continue to challenge scientists who attempt to discover all of its components.
REFERENCES


Bloomberg, M. Creativity as related to field independence and mobility. J. Gen. Psychol., 1971, 118, 3-12.


Clark, F. M. Balance in cognitive skills as related to complex functioning. Psychol. in the Schools, 1967, 4(1), 29-33.


Friedman, H. Perceptual regression in schizophrenia: An hypothesis suggested by the use of the Rorschach Test. J. Genet. Psychol., 1923, 41, 63-98.


Kris, E. Psychoanalytic explorations in art. New York: International University, 1952.


Appendix A

Instructions for brick Uses

"I would like you to list as many uses as you can think of for a common brick. For example: it can be used to build a house, or as a paper weight. Don't worry about spelling or numbering your responses. You will have five minutes. Are there any questions?"
### Originality Rating Scale

<table>
<thead>
<tr>
<th>Points</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Nonsense - absolutely no utility - uncertainty of use, e.g. &quot;to train a dog&quot;, uses provided as examples by the experimenter.</td>
</tr>
<tr>
<td>1</td>
<td>Very common uses - &quot;bordering patios and gardens&quot;, &quot;as weights&quot;, &quot;to build shelves&quot;.</td>
</tr>
<tr>
<td>2</td>
<td>Less common uses - &quot;to block tires&quot;, &quot;to send messages&quot;, &quot;as an art object&quot;, &quot;to hold doors&quot;, &quot;to crush and cramp&quot;, &quot;weight lifting&quot;.</td>
</tr>
<tr>
<td>3</td>
<td>Uncommon uses - &quot;use in a toilet bowl&quot;, &quot;as a knife sharpener&quot;, &quot;as a measure&quot;, &quot;as a pencil sharpener&quot;.</td>
</tr>
<tr>
<td>4</td>
<td>Transformation - &quot;to crush for sand&quot;, &quot;hollow out&quot;. Elaboration of common uses - &quot;to tie on to something as a weight&quot;. Borderline fantasy - &quot;keep child from growing&quot;. More abstract idea - &quot;test Galileo's theory&quot;.</td>
</tr>
<tr>
<td>5</td>
<td>Extremely novel or clever: Elaboration of a transformation - &quot;to grind up for powder for paint&quot;. Abstract idea, brings metaphorical or literary image - &quot;something for a scholarly man to think about&quot;. Images of fantasy - &quot;ornament on a necklace for a giant&quot;. Playful or humorous - &quot;hold hair down&quot;.</td>
</tr>
</tbody>
</table>