FIGURES OF SPEECH, DIVERGENT THINKING,
AND ACTIVATION THEORY

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FIGURES OF SPEECH, DIVERGENT THINKING, AND ACTIVATION THEORY

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TABLE OF CONTENTS

LIST OF TABLES ........................................................................ v

Chapter

I. INTRODUCTION .................................................................. 1

  The Statement of the Problem
  The Purposes of the Study
  Hypotheses
  Theoretical Background of the Study
  Activation Theory
  The Figure of Speech as Production of Novelty
  Definitions
  Limitations
  Procedures Followed in Collecting the Data

II. REVIEW OF THE RELATED LITERATURE ......................... 29

  Divergent Thinking and the Torrance Battery
  Novelty
  Metaphor and the Creative Process
  Stimulating Creativity in an Educational Environment

III. METHODS AND PROCEDURES ........................................ 57

  Selection of the Subject Population
  Procedures Followed
  The Torrance Tests of Creative Thinking
  Reliability
  Validity
  Rating of the Student Compositions
  Procedures for Treating the Data
  Summary
IV. INTRODUCTION, FINDINGS, DISCUSSION, CONCLUSIONS, IMPLICATIONS, AND RECOMMENDATIONS

Introduction
Findings
Discussion
Conclusions
Implications
Recommendations
Suggestions for Additional Research

BIBLIOGRAPHY
LIST OF TABLES

<table>
<thead>
<tr>
<th>Table</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. Figures of Speech Scores of High and Low Divergent Thinking Subjects</td>
<td>76</td>
</tr>
<tr>
<td>II. Correlations Between Figures of Speech Scores and Divergent Thinking Factors</td>
<td>77</td>
</tr>
<tr>
<td>III. Figures of Speech Scores on the Essay and the Narrative</td>
<td>78</td>
</tr>
</tbody>
</table>
CHAPTER I

INTRODUCTION

The figure of speech is popularly regarded as a device of rhetoric which serves mainly as an ornament of language, as an agent in producing "flowery" language. This concept of the figure of speech is largely the product of the thinking of eighteenth and nineteenth century rhetoricians, who thought the figure of speech was to be used in poetry and in oratory (51). The notion of figurative language as a decoration of language still pervades the teaching of language in contemporary public schools (51). In recent years, however, semanticists and linguists (11, 13, 14, 17, 48, 56, 57, 59) have come to view metaphor, which Barfield says "covers the whole gamut of figurative language . . . and expresses the essential nature of figurative language" (7, p. 53), in a new light. The metaphor is now thought of as a basic process of language, called by Embler "the principles of organization by means of which we sort out perceptions, make evaluations, and guide our purposes" (17, p. vii), by Upton "the very hallmark of linguistic maturity" (56, p. 72), by Leondar "an agent of discovery" (35), and by Upton "a creative instrument" (56, p. 226). There is some indication in the literature of research in creativity that the metaphorical process is related to creativity.
Ashley (4) analyzed theories of creativity and of rhetoric and concluded that, to stimulate creative writing, the teacher must aid the pupil in image-forming. Gordon and his Synectics groups, conductors of action research in industrial creativity, use the metaphorical process as the primary operational mechanism in creating new inventions and solving industrial problems (26). Guilford (24) has used figure of speech tests in assessing expressional and associational fluency, two of the divergent thinking factors in the Structure of Intellect Model. Spontaneous flexibility, also a divergent thinking factor, involves the "jumping" from one class of information to another in search of a variety of answers for a problem (24, p. 15). This "jumping" process is akin to the metaphorical process in which "new meanings emerge by the combining of previously ungrouped combinations of elements (57, p. 85). The divergent thinking factor most commonly associated with creativity, that of originality, or novelty as it is called by Gordon (26), Arnold (3), and Maddi (36), is explained as the ability to "bring together seemingly disparate ideas to form a new totality, the components of which have in the past have been logically incompatible" (3, p. 129). This explanation of originality is strikingly similar to the metaphorical process. Thus, there seems to be a relationship between the metaphorical process and divergent thinking, and in a larger sense, between figures of speech and creativity.
The literature concerning creativity has dealt with three major areas: the individual, his characteristics, and the processes through which he arrives at the creative product; the environment, its facilitating or inhibiting effect on creativity; and the relationship of creativity to the transaction between the individual and his environment (50, p. 1).

Many investigators have attacked the field of creativity without a theoretical framework, and some of those who have had a theory have not attempted to apply it to all three of the just-mentioned areas of creativity. Guilford (23, 24) has investigated the cognitive processes related to creativity. Torrance (53, 54) has investigated the identification of creative persons and the educational atmosphere most conducive to their development, and there has been a number of motivational theories (2, 21, 34, 42, 47). One relatively new theoretical framework that has relevance to the divergent thinking factors mentioned previously is offered by Maddi (36).

Maddi proposes that the theory of the interoceptive need for variation in the form of the production of novelty holds much promise for the investigation of creativity (36). This need for novelty theory is an outgrowth of the activation theory of Fiske and Maddi (20) and is supported by a number of sophisticated investigations (31, 38, 39, 40, 41, 46). Briefly, the activation theory of Fiske and Maddi posits that persons have a level of activation that is characteristic of them, that the organism attempts to maintain that level for comfort, that this characteristic level of
activation reflects having lived in an environment that ordinarily provides moderately varied stimulation, and that when, because of monotony, the activation level falls below the normal level, the organism shows evidence of a need for novelty. Maddi (40, 41) found that such a need for novelty is expressed in three ways: by the production of novelty, by an active exploration of external environment, and by a passive appreciation of novelty. Although Fiske and Maddi based their thinking on studies concerned with group averages, they believed that the characteristic level of activation would vary from person to person (20), just as all other cognitive and affective dimensions of personality vary from person to person. Further, the need for variety is broad enough to find different forms of expression in different people (20, pp. 443-444).

In nearly all Maddi's work, he used as a measure of the production of novelty, stories written by the subjects and rated for novelty of plot, character types, and plot endings. In those studies specifically related to creativity, the creativity measures have been the Bricks Test (23), an Anagrams Activity (5), a sticks and figures task, two factors of Cattell's 16 Personality Factor Questionnaire (15), and the Remote Associates Test (31). If, as Maddi posits, there is a positive relationship between the need for novelty as expressed by the production of novelty and the creative ability of persons, then a similar relationship should exist
between other measures of the production of novelty and of creative ability. Further research is needed to determine whether this relationship is valid or whether the relationship is a function of the instruments that Maddi has used to assess the production of novelty. It is in the relationship that appears to exist between creative ability and the production of novelty that the metaphorical process has relevance to the larger motivational theory of creativity offered by Maddi (36).

It has been mentioned that the literature indicates a relationship between the divergent thinking factors and the metaphorical process. The explanation of originality as the ability to bring together hitherto incompatible elements into a new totality is very similar to the workings of the making of metaphor (57, p. 55). It seems reasonable, then, to propose that if originality and the metaphorical process are similar in process, and if originality and novelty are the same divergent thinking factor (3, 26, 36), then the production of figures of speech can be regarded as being a measure of the production of novelty. Pearson and Maddi (46) have supported this proposition by their study in which they used a figure of speech task to attempt to devise a structured measure of the need for novelty as expressed by the production of novelty. The result was the Similes Preference Inventory, in which persons were to select endings to partially completed similes, ranging from trite to novel.
However, this instrument did not, as its makers suggest, assess the ability to produce novelty, but only the subject's preference for novelty, in that the subject chose the ending he liked. If the relationship between the production of novelty and creative ability is to be tested beyond Maddi's findings, then a measure that (1) is different from the one Maddi used, and (2) will assess the production of novelty, must be selected. Since the incidence of figures of speech met these two conditions, it was selected for use in the present study.

As an assessment of creative ability, four sub-tests of the Torrance Tests of Creative Thinking, Verbal Test A (55), were selected. These tests tap the divergent thinking factors of fluency, flexibility, originality, and elaboration that were discovered by Guilford (24).

The Statement of the Problem

The problem was to investigate the relationships between the incidence of figures of speech in selected types of pupils' compositions and pupils' divergent thinking.

The Purposes of the Study

The general purpose of the study was to investigate the relationship between creative ability and production of novelty. Specific purposes of the study include the following:
1. To determine whether there is a significant relationship between high and low divergent thinking pupils with respect to the incidence of figures of speech in their compositions,

2. To determine whether there is a significant correlation between the incidence of figures of speech in pupils' compositions and the divergent thinking factors of fluency, flexibility, and originality, and

3. To determine whether the incidence of figures of speech is greater in some types of compositions than in others.

Hypotheses

Hypothesis I

With respect to the mean figures of speech scores on both compositions, on the essay, and on the narrative, there will be no significant difference between high and low divergent-thinking pupils.

Hypothesis II

A. There will be no significant correlation between the combined figures of speech scores on both compositions and fluency, flexibility, and originality scores.

B. There will be no significant correlation between the figures of speech scores on the essay and fluency, flexibility, and originality scores.
C. There will be no significant correlation between the figures of speech scores on the narrative and fluency, flexibility, and originality scores.

Hypothesis III

There will be no significant difference between the mean figures of speech scores on the essay and on the narrative composition.

Theoretical Background of the Study

A number of motivational theories have attempted to account for the creativity of men. The theories hold that creativity is the outcome of a drive, the result of the sublimation of erotogenic or death instincts, a compensation for inferiority, or a desire for immortality. Some theories are avoidance theories (36), conceptualized in terms of organismic tension and the diminishing of stimulation through instrumental behavior (36). Others are approach theories, focusing upon tension increase and the search for more stimulation.

Avoidance theories are perhaps best represented by the psychoanalysts, who credit creative activity to the sublimation of sexual or destructive impulses. The idea that the motivational basis of creativity is the result of transformed sexual energy is largely a product of the late nineteenth-century thinkers (33). Tolstoy (43) suggested that "Art is transmitted feeling." Nietzsche (45) wrote that "the desire
for art and beauty is an indirect longing for the ecstasy of sexual desire." Freud (21, 22) thought that civilization is founded on the suppression of instincts and the diversion of energy to cultural achievements. "Sublimation of instinct is an especially conspicuous feature of cultural evolution; this it is that makes it possible for the higher mental operations, scientific, artistic, ideological activities, to play such an important part in civilized life" (21). Freud speaks of creativity being related to the wish-fulfillment process so that "imaginative creation, like day-dreaming, is a continuation of and substitute for the play of childhood" (22). Some theorists support the concept of sublimation but disagree with Freud as to what is sublimated. Abraham (1) and Brill (12) believe it is the pregenital oral impulses that are sublimated instead of sexual impulses. Brill calls poetry "an oral outlet" (12), having observed that primitive and children's poetry has many references to food. Bergeler (9) contradicts Freud in that he regards creativity as an expression not of wishes but of defenses against wishes, with the roots of the sublimation inevitably in the oral stage of development. In other words, creativity is a defense mechanism in which, for instance, a writer reduces his guilt feelings by enlisting the reader as an accomplice (9).

Some psychoanalysts have regarded artistic activity as a restitution process in which destructive impulses of infancy remain in the unconscious of mature people (19, 27, 34).
Destructive fantasies are accompanied by restitution fantasies that alleviate guilt and anxieties. Since destructive urges are the chief source of inner tension (50) and since creative activity relieves this tension, Fairbain (19) suggests that the principle of restitution is the governing principle in art. Grotjahn sees creativity as a kind of atonement for original aggressive trends (27). Lee suggests that aesthetic states of mind exist in order to relieve tension caused by destructive rage that a person is not sufficiently able to repress (34).

Approach theories often are spoken of in terms of self-actualization tendencies. Goldstein (25) held that the only drive is that of self-actualization so that cultural achievements are not the result of sublimation of repressed drives, but are the expressions of man's creative power and of the tendency to actualize his nature. Maslow (42) also proposes that creativity is the result of a self-actualization force, feeling that the primary processes (spontaneity and originality) are more important to creative activity than the secondary processes (talent, training, effort). Rogers (49), concerned with the process of creativity rather than with the product, labels the creative motive "man's tendency to actualize himself, to realize his potentialities" (49). He describes three inner conditions of creativity: openness to experience, an internal locus of evaluation, i.e., independence of external evaluation, and the ability to toy with
elements and concepts. Jung regarded the creative process as a "living thing, implanted as it were, in the souls of men" (32). It operates imperiously, absorbing the whole individual with little regard for health and happiness. The artist obeys foreign impulses that have power over him that he is unable to command (32).

Other approach theories are psycho-physiological in nature. Hart (28) regards synthesis, or integration, as a primary characteristic of life on the biological level and as a psychological ego function expressed in creative efforts. Hirsch (30) speaks of an inherent drive that underlies the creative process and compels the genius to create. Like play, the creative process stems from a psycho-physiological state of surplus energy. White (58) suggests the existence of a fundamental urge toward competence, as fundamental as the urge to procreate.

Besides the larger theories of avoidance and approach, a number of miscellaneous theories have been proposed. Adler (2) regarded aesthetic thinking as compensation for inferiority, i.e., the defects in an organism are compensated for psychologically. He also suggested that the fear of death experienced as a child leads to a desire to overcome death by producing aesthetic products that will outlive the producer. Rank (47) also believed that the creative impulse springs from the tendency to immortalize oneself. Barron (6) speaks of creativity as a need to find order where none appears.
Activation Theory

The activation theory of Fiske and Maddi (20) grew out of their research into the relationships of varied experience to human behavior. The study of the variety of stimulation, however, was not new. As early as 1868, Bain (20) wrote about the craving of the senses for stimulation. More recently, Hebb (29) with his study of the central nervous system and Berlyne (10) with his study of exploratory behavior have contributed much to the Fiske and Maddi activation theory.

Fiske and Maddi posit three generalizations that summarize the functions of varied experience in human behavior. First, variation in stimulation contributes to the normal development and functioning of the organism. Second, varied experience is oriented toward and sought out for its own sake. And third, varied experience contributes to the affective state of human beings (20, p. 13).

These three generalizations point out that at least some variation in stimulation is sought out by organisms and may be required for normal development and functioning. Variation also has arousing effects on the organism. Fiske and Maddi point out that stimulation sought by the organism may be exteroceptive, interoceptive, or cerebral. That is, not only external stimulation may cause arousal, but also internal stimulation and thought (20, p. 19).
Stimulation consists of three dimensions: intensity, meaningfulness, and variation, the total activating effects of which are referred to by Fiske and Maddi as impact (20, p. 14). The impact in turn determines the level of activation, which is a "basic dimension referring to the common core in such variables as alertness, attentiveness, tension, and subjective excitement" (20, p. 14). These dimensions are thought to be the function of the reticular formation, a column of nerve cells extending through the lower brain. It is called reticular because it is a network of short fibers and cell bodies with many synapses (10, p. 46). Thus, variation contributes to impact, which then determines level of activation.

There is a characteristic level of activation that an organism maintains. Whenever exteroceptive or interoceptive stimulation provides low levels of impact, as in monotonous situations, which lowers the level of activation, the organism typically orients toward or seeks out new and different stimulations. Thus, some behavior is not tension-reducing, but tension-increasing.

Although intensity and meaningfulness are dimensions of impact, variation in stimulation provides most of its effect on level of activation. That is, "the impact of a stimulus is very largely a matter of the extent to which it differs from a whole range of preceding stimuli. The variation can be called novelty, that is, stimulation not only different but new to the organism" (20, p. 24).
Whenever the organism has some specific task to perform, it tends to modify its activation level toward an optimal performance zone. The performance of a task is a function of activation level, and an organism has an optimal performance zone that varies according to the task. Generally, intellectual and skilled tasks require lower levels of activation than do physical tasks (20, pp. 34-35). However, in the absence of specific tasks, the organism behaves so as to keep the activation at its characteristic level. When the level drops for lack of activity or because of routine, monotonous tasks, the organism is attracted to new, changing, interesting stimulation and may even attempt to produce such stimulation (20, p. 43).

It is recognized that any cognitive, affective, or physiological dimension of personality exists in varying degrees in persons. It was reasonable, therefore, that, although Fiske and Maddi based their thinking on group averages, they would believe that the characteristic level of activation and the corresponding need for variation would vary from person to person (37). Further, the need for variation is broad enough to be expressed in different forms by different people (20, pp. 443-444).

Maddi et al. (37) used thematic apperception to search for expression of the need for variety because whatever forms the expressions take would be likely to be as unstructured as the thematic apperception instrument. Maddi et al. (37)
concluded that the need for variety takes three forms. At a low level of activation, there is a desire for novelty that is expressed in a passive appreciation for novelty whenever it is perceived. In a monotonous situation, the person wishes something novel would occur but does little to actualize the wish. At a higher level of activation, there is an active, exteroceptive form of the need for variety that leads to focusing upon tangible external stimuli and manipulating them in some way to obtain novelty. Maddi regards this kind of expression as curiosity (one of the dimensions assessed by the thematic apperception instrument), for the subjects who were classified as active, exteroceptive tended to explore the external environment (in the form of a room with many objects in it) and tended to score low on a measure of introspection.

At a high level of activation, Maddi et al (37) identified the active, interoceptive form of the need for novelty. Instead of exploring the external environment in more than a cursory manner, the subjects classified as interoceptive tended to sit and be "lost in thought." They also scored very high on a measure of introspection. Maddi concluded that active, interoceptive persons tended to respond to internal rather than external stimulation, and because they scored highest on the novelty of productions measure, they were classified as active producers of novelty.
Thus, it can be said that according to the level of activation, persons are passive consumers of novelty, active consumers of novelty, or active producers of novelty. It is this latter group that Maddi (36) refers to as persons likely to be creative. More generally, the personality type likely to have motivational characteristics relevant to the production of creative acts is the one in which the need for novelty is intense (36). In the Fiske and Maddi theory, it could be said that wanting, seeking, or producing novelty would be ways of increasing the impact of stimulation and therefore the level of activation.

In summary of the Fiske and Maddi activation theory, the level of activation refers to the state of excitation of the brain structure. Impact is that property of a stimulus that affects activation level and its sources are the variation, intensity, and meaningfulness of the stimulus. Most of the impact of a stimulus is accounted for by the variation of the stimulus. The organism has its own characteristic level of activation which it modifies toward a level of performance best suited for specific tasks. When non-specific tasks are present or when routine lessens the intensity of impact, the organism commonly attempts to sustain activation level by seeking or producing stimulation with variation.

Thus, Fiske and Maddi (20) view the organism as active rather than reactive. It is more than an organism equipped with response mechanisms as the drive-reduction theorists
have suggested. It is true that drive-states exist, but the organism, even when new stimulation presents no demands on the organism, utilizes the stimulation to sustain its internal processes. The stimulation becomes important for its own sake, so important that the person may seek out or seek to produce novel stimulation almost as an end in itself (20, p. 55).

Further, the need for varied experience is construed by Fiske and Maddi (20) as the need of higher organisms for the environment in which they have developed. Thus, human beings normally experience variety because they have a variety of sensory receptors and because they live in an ever-changing world which their own activity is partly responsible for. Having developed in such a world, human beings have come to require such a world "not only to maintain their capacity for adaptation, but also to sustain their internal processes" (20, p. 55).

The Figure of Speech as Production of Novelty

The rationale for the selection of the incidence of figures of speech as a measure of the production of novelty is to be found in the Fiske and Maddi (20) definition of novelty and in the manner in which the figure of speech functions within that definition. Fiske and Maddi define novelty as "the extent to which a given stimulus differs from the entire range of previously experienced stimuli" (20, p. 24).

The difference between stimuli is a qualified difference, however, for it is rare for an organism to experience an entirely new stimulus. Everything that is perceived by an
organism is qualified by what it has already perceived. Hence, the factor of similarity is important to the novelty impact of a stimulus. Recognizing this, Fiske and Maddi indicate that the novelty impact of a stimulus depends primarily on the meaning of the stimulus (20, p. 25).

Meaning, as in Fiske and Maddi's context, suggests relevancy. A stimulus will not have any meaning to an organism unless it is relevant, i.e., unless the stimulus has some degree of similarity to the organism's previously experienced stimuli. "A stimulus pattern owes its status as something novel to comparison with a specific class of familiar patterns. A pattern is relevant if some response associated with it is detectably generalized to the present pattern" (10, p. 21).

Thus, the novelty of a stimulus depends upon its deviation from what the organism has known, and the impact value of the novel stimulus depends upon the meaningfulness (a function of similarity) of the stimulus.

The figure of speech is defined as "the generic term for any artful deviation from the ordinary mode of speaking or writing" (16, p. 426). Historically, these kinds of deviations have been classified by scholars as being of two kinds: deviations in order (schemes) and deviations in meaning (tropes). The metaphor is one of the tropes, and the tropes, or deviations in meaning, are essentially metaphorical. When the language scholars cited previously (11, 14, 17, 56, 57) speak of the figure of speech or of figurative language, they
have in mind the tropes. The figure of speech is essentially metaphorical in that it is an attempt to express the unfamiliar in terms of the familiar. Brown (14) defines metaphor as "an attempt to express in terms of experience thoughts lying beyond experience, to express the abstract in terms of the concrete . . . ." (14, p. 33). This definition of metaphor meets one of the requirements of novelty as defined by Fiske and Maddi (20)—the requirement of similarity. "Human subjects invariably react to unfamiliar, meaningless material by observing that it is like something with which they are acquainted, while noting in what ways it differs" (8, p. 38). Although the use of the word invariably in the preceding sentence must be questioned, the essential meaning of the sentence is true, i.e., the perceptions of stimuli are qualified by what the organism has already perceived.

Metaphor, like novelty, has another aspect, the aspect of deviation, which is a second requirement of the Fiske and Maddi definition of novelty. Brown further defines metaphor as "words transferred from their original and proper sense to a new sense" (14, p. 29). There exists, then, in the metaphor, and thus in the figure of speech, the same relationship between deviation and similarity as exists in the novelty of a stimulus. A stimulus is novel because it is different from what the organism has experienced, and is meaningful because it is similar to what the organism has experienced. A figure of speech is a transfer of a word from a familiar context to a different
context. The recognition of a word, expecting it to have a familiar meaning, and discovering it to mean something new produces surprise. Berlyne, speaking of the status of a novel stimulus in a stimuli pattern, refers to Joyce's use of expressions that diverge from familiar phrases while leaving their origin clear, e.g., "And how long has he been under loch and neagh?" (10, pp. 252-253).

It is logical to assume then that a figure of speech is a novel form of verbal expression and that the making of figures of speech in verbal expression is a representation of the production of novelty. This use of the incidence of figures of speech as a measure of production of novelty is a departure from Pearson's (46) attempt to do the same thing, for she devised a multiple-choice instrument in which subjects selected one of four endings to partially completed similes. This instrument can be regarded as a measure of a person's preference for novelty, but not of production of novelty, for the subject does not produce anything. So, Pearson's (46) study did not support the existence of a relationship between creative ability and production of novelty. It is important that this relationship be researched beyond the experiments of Maddi (40, 41) to determine whether the relationship is valid or whether it is merely a function of the method of assessing the production of novelty.

The investigation of the relationship between creative ability and production of novelty as measured by the
incidence of figures of speech has other significance than the significance of adding to the knowledge of the Fiske and Maddi (20) activation theory as it relates to creativity. The figure of speech was thought by eighteenth and nineteenth century rhetoricians to be merely an ornament of language to be used in poetry and oratory. This notion of the figure of speech as ornament still is widely taught in the public schools (51) in spite of the recognition by twentieth century language scholars (11, 14, 56, 57) of the role of the figure of speech in the basic language processes, and in spite of indications of relationships between the metaphorical process and creativity. If the figure of speech does play an important role in basic language processes, the study of the figure of speech has implications for the teaching of language in the schools. If it is true that the making of figures of speech, the metaphorical process, is related to divergent thinking ability, then the study of such a relationship has implications for educational programs designed to foster creativity.

Definitions

1. **High and low divergent thinking pupils** are those whose scores on each of the divergent thinking factors of fluency, flexibility, and originality fall within the upper or lower twenty-five per cent of the total distribution.

2. **Figures of speech score** refers to the number of figures of speech found in the first 225 words of a composition, as determined by a count of the raters.
3. The figures of speech used in this study to determine the figures of speech scores are listed as follows:

   a. **Metaphor** is direct or implied comparison between things that are essentially different,

   b. **Simile**, like the metaphor, compares unlike things; the form is different in that *like* or *as* is used,

   c. **Synecdoche** is a figure in which a part stands for a whole, the material represents the product, and other like representations,

   d. **Metonymy** is a figure in which a related thing stands for a real thing,

   e. **Personification** is the representation of an inanimate thing as having personal attributes,

   f. **Pun** is a play on words in which a transferance of meaning occurs, creating a surprise,

   g. **Hyperbole** is exaggeration, a kind of distortion of meaning, and

   h. **Litotes** is understatement, another distortion of meaning.

4. The essay composition referred to in this study was an exposition of the topic "Civil Disobedience," based on the subject's opinions and experience.

5. The narrative composition referred to in this study was a story, written in support of the subject's views about civil disobedience.
Limitations

The findings of this study are limited to the population from which the sample was drawn.

Procedures Followed in Collecting the Data

Four sections of freshman English classes were selected, providing a total of 106 subjects for the study. The subjects were administered four sub-tests of the Torrance Tests of Creative Thinking, Verbal Test A which were the Product Improvement Activity, Unusual Uses of Cardboard Boxes, Unusual Questions, and Just Suppose Activity (55). Subjects were also asked to write two compositions, one an essay, the other a narrative, on the general topic of "Civil Disobedience." The test scores and the figures of speech scores were tabulated and sent to the North Texas State University Computer Center for computation. Conclusions from the statistical data were drawn. The results are reported in Chapter IV of this study.
CHAPTER BIBLIOGRAPHY


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CHAPTER II

REVIEW OF THE RELATED LITERATURE

The literature reviewed for the present study is grouped into four categories: (1) studies and theoretical writings dealing with the divergent thinking factors of Guilford (21) and their bearing on the Torrance Tests of Creative Thinking (49), (2) studies and theoretical writings dealing with the metaphorical process and its relationship to creativity, (3) studies and theoretical writings dealing with novelty, and (4) studies and theoretical writings dealing with the stimulation of creativity in an educational environment.

Divergent Thinking and the Torrance Battery

The term divergent thinking was made famous in the field of creativity by J. P. Guilford (21) and has become a general term for creative thinking, in spite of Guilford's indication that "creative thinking cannot be exclusively allocated to any one set of intellectual factors" (21, p. 11). The divergent thinking factors are one set of mental operations in the Structure of Intellect Model constructed by Guilford and associates. Tracing the development of this model, Guilford (21) reports that in 1955, he first attempted to organize the known intellectual factors, which consisted of six classes: Memory, symbolism, discovery, production, divergent thinking,
and evaluation (21, p. 2). By 1956, the major factors had been reduced to five categories: cognition, convergent thinking, divergent thinking, evaluation, and memory. Within these categories could be placed some forty intellectual factors. By 1958, Guilford regarded the intellectual model to be relatively complete, consisting of three sets of factors in a three-dimensional model: operations, products, and contents (21, p. 4).

The divergent thinking factors are defined by Guilford as "the generation of information from given information, where the emphasis is upon variety of output from the same source" (21, p. 5). Speaking of creative thinking, Guilford states:

Creative thinking is invention, for one thing, and invention is a form of production. There is a connotation that in invention we get away from conventional answers, hence conclusions are not uniquely determined. All this points clearly to the category of divergent production. This category includes the factors of fluency, flexibility, originality, and elaboration . . . we might therefore equate creative thinking with divergent production (21, p. 11).

The concept of divergent thinking as a kind of creative thinking was not Guilford's concept; in fact, he listed it among the known intellectual factors that he first organized into a structural model (21, p. 2). The literature suggests that the kind of thinking represented by the term divergent thinking has been investigated or speculated upon for a long time. Torrance reports that Burnham in 1892 distinguished between reproductive thought and productive thought, that
the mental abilities involved in remembering and in reproducing are different from those used in recombining original impressions to produce new wholes (49, p. 7). Spearman (49, p. 8) spoke of the power of the mind to create new content by transferring relations, an operation similar to the "generation of information from given information" (21, p. 5). Simpson, as reported by Torrance (49) defined creative ability as the power to break from ordinary sequences of thought. He thought that identifying the kind of mind that searches, combines, and synthesizes was important.

More recent thinking supports the concept of divergent thinking as synonymous with creative thinking. Newell, Shaw, and Simon (38) indicate that creative problem solving must include one or more of the following conditions:

1. The product has novelty and value.
2. The thinking is unconventional.
3. The thinking requires high motivation and persistence.
4. The problem posed was vague and undefined, so that formulating the problem was part of the task.

In developing the Torrance Tests of Creative Thinking, Torrance used the following definition of creativity:

... a process of becoming sensitive to problems, deficiencies, gaps in knowledge, missing elements, disharmonies, and so on: Identifying the difficulty; searching for solutions, making guesses, or formulating hypotheses about the deficiencies; testing and retesting these hypotheses and possibly modifying them and retesting them; and finally communicating the results (49, p. 6).

Torrance believes the definition to describe a natural process involving human needs, like tension in the presence
of disharmony and incompleteness. To reduce the tension, persons finding ordinary behavior to be inadequate turn to the novel solutions. Such a definition is consistent with the concept of creative thinking as found in the divergent thinking factors, in that the idea of searching in a variety of information fields for answers which do not yet exist is implicit in them both.

Torrance's tests, although different in form and purpose from Guilford's tests, which are not intended as identification instruments as much as instruments to study intellectual processes, assess an individual's creative efforts in the activities in terms of the divergent thinking factors of fluency, flexibility, originality, and elaboration. Stubbins (44), comparing the Torrance battery to the Guilford battery, found, using 100 adolescents, a correlation of .56 between the total scores of the two tests. Reporting correlations ranging from .11 to .51, Stubbins found that the Torrance verbal battery correlated more highly with the Guilford verbal battery than did the two figural tests.

Maddi (34), explaining the possibilities of activation theory as a theory of creativity, does not claim that the theory can be used to account for all forms of creativity, for creativity is a dimension too wide for one theory to explain. Maddi does contend, however, that activation theory has promise for the investigation of the production of novelty. Novelty is defined by Fiske and Maddi (17) as "the extent to which a given stimulus differs from the entire range of previously experienced
stimuli" (17, p. 24). This definition of novelty is best matched with the originality factor of the divergent thinking factors of the Guilford model as described in this review. Gordon (19) and Arnold (2) equate originality and novelty as the same factor. Thus, the intellectual dimension of creativity that activation theory seems to hold the most relation to is divergent thinking as defined by Guilford (21) and used by Torrance as the basis of his instruments.

Novelty

Maddi (17) describes a number of conceptual schemes that have attempted to deal with novelty and its relationship to behavior. Hull (25) in his reactive inhibition theory hypothesized that each time the organism makes a response to stimulus, he reduces the likelihood of repeating that same response, so that novel stimuli are more attractive to the organism than the older stimuli. Berlyne (7) postulated that a novel stimulus is believed to increase drive level which is then reduced by exploration of the novel stimulus. This curiosity concept is supported by Montgomery (36), except that he explained increases in novelty as rewarding. Harlow (17) proposed that there is an innate tendency to explore and manipulate, and that novel stimuli serve as releasers of that tendency. Fiske and Maddi (17) propose that there is an interoceptive need for variation (of which novelty is the primary dimension) that is related to the characteristic level of activation of an individual. Supporting this
proposition is a conceptual scheme offered by Hallman (22) who maintains that the production of aesthetic products is pleasurable to the organism, and that these pleasures are biological in nature, ranging from pleasures stemming from tension-seeking in the presence of disharmony and incongruence to pleasures stemming from tension-reduction as the organism transfers the disharmony into an artful whole.

Related to and consistent with the Fiske and Maddi theoretical position are a number of studies dealing with novelty. Some of these studies are concerned with the effects of monotony. One such study deals with the effects of monotony and novelty on imaginative productions. Maddi et al (33) performed the experiment to obtain information about the effects of stimulus monotony and novelty upon imaginative productions in the form of stories written about pictures of people. Prior to the story composition fifty-three subjects of the Monotony Group heard a monotonous recording; forty-nine subjects of the Novelty Group heard a novel recording. As controls, two Free Activity Groups were included who wrote stories after a period of free activity. After writing stories, all subjects completed an adjective check list about activities occurring before composition. The check list results indicate that, in comparison with the free activity period, the monotonous and novel recordings were experienced as monotonous and novel as expected. When the stories were rated for novelty of imagery and desire for novelty, the
Novelty Group and the two Free Activity Groups were similar on both variables. The Monotony Group, however, were higher in desire for novelty, but their actual novelty was lower. Maddi concluded that

Monotonous stimulation from external environment has the effect of increasing desire for expressing novelty in imaginative productions while decreasing in the ability to produce novelty (33).

Barmack (5) in an earlier study reported that, in addition to decreased output during a ninety-minute repetitive task, subjects grew bored, restless, unpleasant, inattentive, fatigued, day-dreaming, and often increased hunger and pains. That interrupting monotonous tasks with novel stimuli helps maintain performance level was the conclusion made by Mackworth (31) in a study in which he found that a telephone call in the middle of a boring test session, urging the subject to do better, restored performance for nearly half an hour. Baker (3) found that while subjects watched a clock as part of a test for an hour, their restlessness increased, and the amount of time spent in not watching the clock increased, which suggests that the subjects were providing themselves with more varied stimulation.

The reinforcing properties of novelty were investigated in a study by Houston and Mednick (24) in which they attempted to determine whether creative subjects would be reinforced by novelty. Sixty undergraduates were divided into high and low creativity groups on the basis of their scores on the Remote
Associates Test. They were then presented with a series of pairs of words (each pair containing a noun and non-noun) and asked to choose the word they preferred. The choice of a noun was followed by a novel association to that noun. Non-noun choices were followed by common associations. The high creative group significantly increased and the low creative group significantly decreased the frequency of their noun choices over the series of pairs. Houston and Mednick theorized that satisfying a need for novelty should reduce the need (just as eating food reduces hunger). If the need is reduced, then it should provide reinforcement. The results of the study bore out such a theory.

Much evidence exists to indicate that high creative persons have a preference for novelty. Barron (6) as part of an extensive program designed to identify individuals who consistently performed with originality, utilized the Rorschach, the Thematic Apperception Test, and a set of inkblots he himself had devised. Indications of originality were reflected in the unusualness of the responses of the projective material. Also given were the Barron-Welsh Art Scale (where a preference for complexity yields a high score) and the Social Dominance Scale of the California Personality Inventory. The results of the study appear to show that people who are original prefer complexity and are capable of becoming interested in ideas which are unusual, novel, and socially tabu.
That the preference for novelty is related to an interoceptive need is supported by the fact that at all ages, novelty has its attractions for some persons. Piaget (41) observed that from five weeks on, the infant looks at somewhat unfamiliar or novel objects rather than at familiar or very new ones. Willis and Dornbush (52), in a recent study, tested five, six, and nineteen year old persons as to the curiosity properties of complexity at various ages. A tendency to select the most complex patterns was found at all ages. A study by Maddi and Andrews (32), in which direct measures of orientation and preference were obtained from the same subjects, indicated that those subjects with the strongest orientation toward novelty (assessed by composing novel stories and devising novel uses for common objects) also described themselves as preferring novel to familiar stimuli.

That there may be a relationship between novelty and psycholinguistics is suggested by a study by Glucksberg and Danks (18). They challenged the traditional view that problem-solving is largely a product of perception, and suggested that verbal or linguistic processes may be more important. They found that when an ordinary object like a hammer or a saw was given a nonsense name, the novel use of the object was significantly increased. Glucksberg and Danks concluded that "to some extent what an object is, in terms of what one can do with it, is a function of its name" (18).
Most of the evidence that the need for novelty is related to the production of novelty has been supplied by Maddi (34). He reports that a novelty of productions variable correlated .33 and .28 with two of the Cattell 16 Personality Factors (11), sensitivity to experience and experimenting tendency, respectively. Maddi suggests that both factors indicate a valuing of and a striving for novelty in experience (34). Maddi (34) also found that the need for change and the impulsivity scales of the Stern Activities Index correlated .25 and .26 with a novelty of production variable. Both scales indicate a preference for change and a willingness to act so as to induce change. That the persons who are producers of novelty respond more to an internal stimulation rather than to external is supported by a report by Maddi (34) in which novelty of production correlated negatively (-.42) with an external exploration variable whereas with two introspective tasks, novelty of productions correlated .27 and .26.

The following conclusions seem to be warranted from the review of the literature on novelty and its relationship to creativity:

1. persons who are creative seem to prefer novelty.
2. they also seem to be motivated more by internal stimuli than by external stimuli.
3. reinforcement of novel responses increases them.
4. monotony seems to increase the desire for, but to decrease the production of, novelty.
Metaphor and the Creative Process

The rapid development of an important new field, psycholinguists, has been largely due to the recognition in recent years of the significance for psychology and for education of the study of language and how it is learned by children. Krech (27) proposes that it is the study of language processes that will provide the major breakthrough in not only the teaching of language but also in all research dealing with the human mind. It is clear from the psycholinguistic literature that empirical research in the field of language is growing rapidly. With respect to figurative language, however, there have been few actual studies, and those that have been done have not dealt with the creative aspects of figures of speech.

Kaisar (26), for example, sought to determine whether the metaphoric devices of communication have the potential to evoke physiological responses. He found that they did not, but his approach to the problem was based on the recognition of metaphors instead of on the making of them. He had subjects read material, some with metaphors and some without. It would have been more important to find out if the production of a metaphor during composition would evoke physiological responses. For language is essentially productive and the recognition of language through reading is a reproductive process (15, p. 99). Loban (30) used the incidence of figures of speech, all of which were metaphorical, as one of eight factors in measuring language facility of elementary school pupils. He observed
that the incidence of figures of speech in the oral compositions of the subjects in his study was surprisingly scarce.

Carlson (10) used as one measure of originality in rating stories in a study of elementary school pupils' compositions the incidence and quality of figures of speech. Horne (23), using 184 sixth graders, administered experimental pre- and post-tests designed to test understanding of and use of figures of speech. Significant findings were that high I. Q. scores seemed to be related to the understanding of but not the use of figures of speech. Horne used no measure of creativity in the study. Shaed (44) found that figurative language was an "Achilles' Heel" in reading composition, especially to students of poor reading ability. She recommended more concentration on the non-literal aspects of language in the elementary reading program.

Although the literature does not yield many studies about metaphor, there is an abundance of philosophical, theoretical writing about the metaphorical process and its relation to creative ability. The metaphor, as mentioned earlier with the citation of Leondar (29), has been generally looked upon as being merely an ornament of language. Some scholars have attempted to drive it from the "objective, scientific world" (12, 50). Others, however, have indicated that the metaphor is a necessary part of the scientific world and of the world of discovery and invention (9, 13, 19, 42). Dreisdadt (13) analyzed the biographical accounts of great scientific
discoveries with the purpose of determining the role of metaphor and analogy in them. He found that a great number of scientists have credited their discoveries to metaphor, among them Robert Oppenheimer, whose wave theory in electrodynamics was a product of Oppenheimer's observation of the motions of ocean waves, and Niels Bohr, whose complementarity theory in physics was the result of Bohr's realization that a person cannot be known in the light of love and the light of knowledge at the same time. Other instances of scientific discovery based on metaphor include Einstein and his imaginary elevator, falling in the shaft, which led to the Principle of Equivalence of Gravitation and Inertia, and Darwin, whose "living tree" metaphor led to his evolutionary theory.

Bruner (9), realizing that science seems determined to rid itself of metaphor, observed that in developing the theoretical reaches of scientific frontiers, the metaphor is an enormous aid.

It is true that the product of science is not metaphoric, but the process of science is shot through with metaphor at rather critical points in the history of science (9, pp. 10-11).

Gordon (19) and his Synectics Groups, conducting action research in industrial creativity, use the metaphorical process as the primary operational mechanism in the creating of inventions and the solving of industrial problems. The members of the Synectics Groups are selected on the basis of their
ability to think metaphorically, to tolerate and use the irrelevant, to play, and to sustain a "willingness to suspend disbelief" (19, p. 30). With respect to the purging of metaphor from scientific language because the metaphor is not objective, a statement of Reiss (42) is appropriate: "It is possible to avoid metaphorical, or in general, figurative, language only by avoiding the use of language altogether" (42, p. 16).

A number of statements about figurative language, or more specifically, the metaphor, suggest a relationship between divergent thinking and the metaphorical process. Divergent thinking, as defined by Guilford (21) is the "generation of information from given information". The "jumping" from one class of information to another is also characteristic of divergent thinking (21, p. 15). Similarly, metaphor is defined by Embler as "involving a mental transfer from one type of object to another, from one domain to another" (14, p. 4). Wheelwright states that "the essential quality of metaphor lies in the broad ontological fact that new qualities and new meanings can emerge, simply come into being, out of some hitherto ungrouped combinations of elements" (51, p. 85). Bruner speaks of metaphorical effectiveness as

... the connecting of diverse experiences by the mediation of symbol and metaphor and image. Experience in literal terms is a categorizing, a placing in a syntax of concepts. Metaphoric combination leaps beyond systematic placement, explores connections that before were unsuspected. Metaphorical effectiveness is Eliot's achievement in bringing into a single compass
Reiss states that

Every pure idea or abstract meaning is the expression of a figurative transfer, or a metaphor, from a concrete or literal idea, although there need not always be a conscious awareness of the literal correspondent (42, p. 185).

Bruner defines creativity as "effective surprise—the production of novelty. Metaphorical effectiveness underlies the production of novelty" (9, p. 28). Wheelwright speaks of the metaphor in terms of its creative aspects: "Metaphor means the semantic motion—the double imaginative act of reaching out and combining that essentially marks the creative process" (52, p. 72).

Speaking of metaphor as poetic language, Wheelwright states that "Non-poetic language is not adapted to the unique. Poetic language, by contrast, partly creates and partly discloses certain hitherto unknown, unguessed aspects of What Is" (51, p. 51). Hallman speaks of the nonrational aspect of creativity and the role of the metaphor in it:

The nonrational processes function by imposing upon ideas and images the quality of plasticity. Metaphor gives plasticity to language, and makes poetry possible; it gives plasticity to thinking, and makes scientific inventions possible; it gives plasticity to perceptual forms, and makes art possible. Metaphor disengages our belief attitudes from the conditioning induced by logical inference and presents new belief possibilities. It softens the discursive tendencies of language, and consequently allows new meanings to be fashioned. With the inferential limitations
lifted from language and with causal connections uncoupled from objects, these become malleable and therefore make possible new visions, unexpected views of the world and of experience (22, p. 23).

Dreisdadt, referring to the creative insight of scientists that led to famous discoveries, defines insight as

... occurring when one finds a stimulus pattern (analogy) in which parts of the form or structure are like the structure of the problem-situation, and the rest of the structure of this stimulus pattern (analogy) indicates how to organize the unintegrated materials of the problem or how to reorganize the problem by putting the parts that are out of place into their correct place, or both, thereby completing the whole which is the solution of the problem (13, p. 111).

Hallman, explaining the four stages of the creative process (preparation, incubation, inspiration, and verification) in terms of the kinds of pleasure obtained by the creator during each stage, speaks of insight [inspiration] as being "metaphoric, combinatorial, transformational. It is spontaneous, unpredictable, autonomous" (22, p. 145). "Incubation", according to Hallman,

... is essentially a metaphorical activity. It requires the relaxation of voluntary thought processes, the releasing of inhibition of logical controls over the direction of reasoning operations (22, p. 144).

Ervin (15), proposing that children do not learn their language, but actually create their own language, speaks of the processes of transference and analogy as being essential parts of the creating process (15, pp. 177-189). Lenneberg, in an elucidation of the relationships of biology to language,
mentions a biological capacity in man for categorization of his experience, differentiation among experience, and a propensity for transformations of experiences. Transforming semantic meaning from one category to another (from house-shelter to House of Lords or House of David) is a creative process of cognitive organization. Cognitive organization is a never-ending, always-creating process by means of which man deals cognitively with the environment. In this process, the referents of words change, meanings are extended by transformations, and categories of experience remain open for such transformations (28, pp. 332-334). Thus, it appears that metaphorical transference is at the heart of the language process, as was suggested by Barfield that the process of "saying one thing and meaning another is imbedded in the basic process of language development" (4, p. 57) and that "it is important that men should better comprehend the part played by metaphor in the operation and development of language" (4, p. 70).

The review of the literature about metaphor and its relationship to creativity and to novelty suggests that the processes underlying the metaphor are related to creativity and that the divergent nature of these processes are very like, if not the same as, the divergent thinking factors, especially the factor of originality. That originality is equated with novelty suggests that the making of metaphors or figures of speech can be thought of as a measurement of production of novelty.
Stimulating Creativity in an Educational Environment

While some investigators in the field of creativity have been concerned with theories of motivation, with the cognitive factors, and with the identification of the creative individual, other investigators have been interested in how creativity can be fostered. In industry, Osborn (39) and Gordon (19) have action-research studies in progress, attempting to find out how to get creative people to make the best use of their abilities. In college education, the University of Buffalo has for a number of years experimented with problem-solving courses (40). Torrance (46, 47, 48, 49) has written several books on the creative education of children. Even in those investigations not directly focused on the development of creativity, the underlying significance of their findings is their ultimate implementation into ways of developing the creative potential of people.

An analysis of the literature dealing with the development of creativity indicates that two main positions are taken by investigators: the "operational" approach and the "atmosphere" approach. The operational approach is represented by the action-research investigations in business and industry and by programs like that found at the University of Buffalo. Rejecting the directions taken by psychologists in studying creativity, such as the identification of creative people and the study of cognitive and personality factors, Gordon's (19) approach has been to study the process of creativity while it
is in progress. The theory on which Gordon's Synectics
Groups operate is that the creative process can be detected,
incorporated into operational mechanisms, and fed back into
the creating groups with the purpose of deliberately increas-
ing creative activity. Gordon reports much success with this
method of research. The mechanism he has found to be most
effective has been the process of (1) "making the strange
familiar and (2) making the familiar strange" (19, p. 33).
More than a mere play on words, this metaphorical process
involves the mechanisms thought to be at the heart of creativ-
ity (19): connectedness (21, 51), originality (2, 19), and
non-rationality (22, 51). Specifically, the group attacks
a problem by trying to make metaphors from the natural world
and then trying to transfer the metaphoric abstractions back
into practical reality.

Osborn (39) uses the technique of brainstorming as the
basic method of his research, which in a general sense is the
combined effort of a group of people to solve a problem.
Basic to the process is the principle of suspended judgement,
i.e., creative minds should work and then evaluative minds
should work. In a brainstorming group, persons contribute
as many ideas as they can think of without any evaluation
of the worth of the ideas. Later, the group evaluates the
ideas. The University of Buffalo has used the Osborn method
in its problem-solving courses and has reported some inter-
esting results. In one study, ten measures of creativity
were administered to students enrolled in three problem-solving courses and to students not enrolled in a problem-solving course. Those in the courses were matched with those not enrolled on age, I. Q., and sex. After pre- and post-test data were analyzed, it was found that the highly creative students in the problem-solving courses gained significantly more than the control subjects in the quantitative production of ideas, in qualitative ideas, and in dominance. It was concluded that the methods used in the course were responsible for the differences in gains. Reports of successes like this have encouraged other schools to follow the lead of the University of Buffalo in the investigation of creativity from the operational point of view (40).

Most of the writers in the field of creativity do not speak of the development of creativity in terms of "operational" programs, but instead are more interested in discovering the atmosphere most conducive to the development of creative potential. In general, the atmosphere is thought to be one of openness and freedom. Rogers (43) describes the atmosphere that is most conducive to creativity as being one of "psychological safety and freedom" (43, p. 78). Involved in psychological safety are the acceptance of the person as of unconditional worth, providing a climate in which external evaluation is absent, and understanding empathetically.
Psychological freedom is the freedom of "symbolic expression" (43). Anderson states that

The open system is, . . . the ideal, propitious environment for creativity, and anything in the environment that tends to close the system makes the environment unpropitious for creativity (1, p. 253).

Probably the most specific of the proponents of openness as the condition most conducive to creativity is Torrance. Torrance recommends five principles for teachers to apply in order to foster creativity in the classroom:

1. Be respectful of unusual questions.
2. Be respective of unusual ideas of children.
3. Show children that their ideas have value.
4. Provide opportunities for self-initiated learning and give credit for it.
5. Provide for periods of non-evaluated practice or learning (47, pp. 56-57).

It appears that a main difference between those who speak of an atmosphere conducive to creativity and those who speak of an operational approach to creativity lies in their view of creativity itself. On the one hand, those supporting the open environment view creativity as a rather mysterious intellectual quality that every person has to some extent and that needs only to have restrictions in the environment removed in order for it to flourish. Those who support the operational approach view the creative process as a tool in solving problems, a tool the use of which can be developed by conscious deliberate techniques. The former position views creativity more as a "gift" that, unhindered by societal restrictions, will develop on its own; the latter
position views creativity as a talent or skill that can be sharpened to solve problems better.

Some investigators of creativity suggest that a highly stimulating environment helps to develop creativity. Torrance (47) recommends that teachers present a variety of activities designed to stimulate children's thinking. Eyring states that "even the gifted individual . . . requires a stimulating environment" (16, p. 32). Harlow (17) proposed that novel stimuli serve as releasers of the exploratory drive within organisms. Krech (27) reports experiments which indicate that a highly varied and stimulating environment has significant effects on the brains of rats. The brain from a rat in an enriched environment has a heavier, thicker cortex, a better blood supply, larger brain cells, and other similar physiological elements than rats from plain environments. The results of two studies (37, 53) suggest that animals will generally engage in vigorous exploratory activity only in an environment that is noticeably more novel and complex than the one they have become accustomed to. Experiments on the effect of monotony on behavior (3, 5, 31, 33) indicate that lack of novel stimuli has detrimental effects upon the imaginative production of individuals.

From the literature reviewed thus far, certain conclusions can be drawn about the ways of developing creativity. It appears that teaching persons the techniques of the creative process enhances their creative output, allowing individuals
to function in an open, free environment is thought to increase creative output, and filling that environment with varied, novel stimuli increases creativity. Krech (27) questions the effects of a varied environment upon learning by pointing out that in the animal studies of the effects of a varied environment that certain species-specific stimuli accounted for most of the effects. In rats, it appears that the species-specific stimulus is a freedom to explore spatially; in humans it is thought by Krech (27) and by Lenneberg (28) that the species-specific stimulus is language. If this proposition is true, then a highly stimulating environment would be so only to the degree it provided language stimuli.

Maddi (34) challenges the open environment's contribution to the development of creativity, pointing out creative persons in history like John Bunyan, restricted to jail, the Renaissance artists, restricted by their sponsors and by the church, and Galileo, restricted by superstition. These persons did not have open systems, yet creativity took place. Maddi does not suggest that open systems are useless, but he does suggest, basing his propositions on the Fiske and Maddi activation theory, that the motivation for creative production is internal, a biological need. The environment may or may not significantly affect the creative need. Speaking of a highly stimulating environment, Fiske and Maddi (17) indicate that such an environment has most of its effects in the
Developmental years rather than later on. The theory is that a person develops an activation level as he becomes adapted to an environment. This activation level becomes characteristic and greatly affects his behavior. A child, whose parents encourage him to experience a wide range of phenomena and yet protect him from too many extremely novel events, will, as he matures, come to regard the novel as interesting and will perform in a manner likely to produce novelty in the form of ideas and objects (17, pp. 399-400). The effects of a highly novel laboratory-type environment like a classroom have not yet been investigated to the point of reaching any conclusions about them. Maddi (17) suggests that children in contemporary society are born into a highly varied environment. Having become accustomed to such variety, children may consider the stimuli in the classroom to be insufficient for their needs, even monotonous. Maddi's (33) experiments with novelty indicates that monotonous experiences, although increasing the need for novelty, decrease the novelty of whatever is produced. It may be that the best environment for creativity is the one that protects the person from monotony.


34. , "Motivational Aspects of Creativity", Journal of Personality, XXXII (September, 1965), 330-347.


CHAPTER III

METHODS AND PROCEDURES

The problem of this study was to investigate the relationships between the incidence of figures of speech in selected types of pupils’ compositions and pupils’ divergent thinking. This chapter presents the following procedures used in conducting this investigation: (1) selection of the subject population, (2) procedures followed, (3) description of the instrument, and (4) procedures for treating the data.

Selection of the Subject Population

Pupils enrolled in four freshman English classes during the 1968 fall semester at North Texas State University were selected on the basis of their meeting at the same time, twice weekly in mid-afternoon for one and one-half hours. Freshman English classes were selected as a source for obtaining subjects because it was believed that freshman English pupils represented a cross-section of the freshman population of the university.

The four sections of freshman English provided one hundred nineteen subjects. However, because of absences, dropping out of school, and other similar situations, not all of the potential subjects were actually used in the study. Pupils who missed the group administration of the Torrance
Tests of Creative Thinking, Verbal Test A, and those who dropped out of school before having written the narrative composition were similarly dropped from the study. As a result of these drops, a total of 107 students served as subjects.

The data were collected between November 12, 1968, and December 21, 1968, which means that the classes had met approximately sixteen times.

Procedures Followed

After the four freshman English classes were selected, arrangements were made with the instructors for the collection of the data, which consisted of two main operations: (1) the group administration of the Torrance Test of Creative Thinking, Verbal Test A, and (2) the obtaining of an essay and a narrative composition from each subject.

Between November 12 and November 30, 1968, the four classes were given the Torrance Tests of Creative Thinking. The specific administration dates were set according to the convenience of each instructor. All of the creative thinking tests were administered by the researcher. Since the researcher had not previously met with the classes, he was introduced to the class by the instructor, who then left the classroom. However, one instructor chose to remain to observe the proceedings.

It was explained to the subjects that they had been selected as subjects for the collection of data for a
dissertation study, but no information concerning the nature of the study was given. After a few light remarks, designed to produce a relaxed, game-like atmosphere as recommended by Torrance (13), the test booklets were distributed to the subjects, the test instructions were read, and the test activities were completed by the subjects.

Involved in obtaining the two writing samples was the problem of finding a common topic on which all the subjects had written an essay. In discussion with the instructors, it was found that each had assigned, within a two-week period of time, an essay, the topic of which was "Civil Disobedience." This topic was selected as the common topic for the writing samples in the study. From the files of the instructors were selected the subjects' essays on civil disobedience. During the last two weeks in December, 1968, the subjects were asked by their instructors to write in class a narrative that would serve to describe their position on civil disobedience. The required number of words in the narrative was 300, the same as required in the essay. Arrangements were made for absentees to write in class a narrative at a later class period. When these narratives were finally obtained, the collection of the sources for data was completed.

The Torrance Tests of Creative Thinking

The Torrance Tests of Creative Thinking are a battery of verbal and figural activities designed to assess "creative thinking potential in children, adolescents, and adults" (10).
The test activities are models of the creative process itself in that they call for divergent responses from the subjects. Although the tests are a departure from the factor analysis tests of Guilford (7), the responses in the various activities are assessed in terms of Guilford's divergent thinking factors of fluency, flexibility, originality, and elaboration (8).

Each test yields a score for fluency, flexibility, and originality, but methods of assessing elaboration scores have not been established for all the tests. The scores of the various activities are combined by simple addition with no weighting of any of the factors or activities. It is possible to total the fluency, flexibility, originality, and elaboration scores on each subtest and then to total the subtest totals to arrive at a composite creativity score. However, Torrance discourages this procedure, recommending instead that single factor scores, derived by totaling each factor on the subtests, are more descriptive and useful. For example, a single originality score can be derived by totaling the originality scores on the subtests (14). Yamamoto (16) used both methods and found that the composite creativity score did not add much to the predictive efficiency of the creativity measurements. If the tests are being used to identify creative persons, the composite score is satisfactory.
Reliability

According to Holland of the American College Testing Program (10), the evidence for the test-retest and equivalent forms of the Torrance Tests of Creative Thinking is extensive and satisfactory. In fifteen studies using equivalent forms or time intervals from one week to three years, the majority of the reliability coefficients exceed .70, suggesting that the Torrance tests have useful reliability.

A number of the reliability studies used college students as subjects. Dalbec (4) tested forty-three liberal arts college students with Verbal Form A at the beginning of their sophomore year and with Verbal Form B almost three years later near the end of their senior year. Reliability coefficients of .59 for fluency, .35 for flexibility, and .73 for originality were obtained. Using the Ask-and-Guess, Product Improvement, Unusual Uses, Incomplete Figures, and Circles sub-tests, Goralski (6), testing student teachers at the beginning and end of a ten-week interval, obtained coefficients of .82, .78, .59, and .83 for fluency, flexibility, originality, and battery total score. Sommers (11) obtained coefficients of .97 and .80 in a test-retest of two different samples of college students, with a lapse of ten weeks between testings. Yamamoto (17) allowed ten weeks to elapse between his testing of twenty-two college seniors and for fluency and "good quality responses" obtained reliability coefficients of .83 and .78, respectively.
Validity

The validity of the Torrance Tests of Creative Thinking rests on more than fifty investigations using samples of children, adolescents, and adults. Most of these are concerned with construct and concurrent validities (10). Torrance reports two studies (Haven, 1965; Weiser, 1962) involving college students and dealing with construct validity. Weiser administered the Torrance Tests of Creative Thinking, an adjective checklist of 300 items, and the Education Interest Inventory. Students scoring in the upper 27 per cent on the creativity measure were compared to students scoring in the lower 27 per cent. No differences could be found in teaching majors, in preferences for elementary or secondary teaching, or in plans for graduate work. On the Education Interest Inventory, the professor scale characterized the high group.

Of the 300 items on the adjective checklist, 89 were significantly related to creativity scores. Torrance reports that many of the 89 adjectives are commonly associated with creativity, such as adventurous, courageous, determined, energetic, humorous, individualistic, industrious, and versatile (13). In Haven's study, 120 male sophomores were given a checklist of creative achievements, the Allport-Vernon-Lindzey Study of Values, and the Torrance Tests of Creative Thinking. A statistically significant but relatively small correlation coefficient between the originality measurement of Verbal Form A and scores on the creative achievement
checklist \( r = .21 \) was obtained. The only significant correlation between the originality measure and scores on the Study of Values instrument was with the Aesthetic scale \( r = .23 \). Torrance attempts to explain the low correlations by noting that the creativity scores of this sample were lower than most college and high school samples.

With respect to concurrent validity, Torrance (13) reports only two studies involving college students. Sommers and Torrance conducted a validity study at Stout State College, using creativity in industrial design as the criterion in obtaining teacher nominations. Teachers were asked to nominate students outstanding for their creativity and students notable for their lack of it. In a larger study, the Torrance Tests of Creative Thinking had been administered. In all, ten creatives and twelve noncreatives were available. The mean total score of the creative group was 237.4; the mean score of the noncreatives was 179.25. The difference in means was significant at better than the .05 level of confidence. Only one of the noncreatives achieved a score equal to the mean of the creatives.

Seventy-five students in an educational psychology course were given a forty minute battery of the Torrance tests. These scores and scores on the Miller Analogies Test were used as predictors in the study by Bentley (13). In the course four kinds of examinations were given: (1) a multiple-choice test requiring recognition, (2) a completion and
short-answer test requiring recall, (3) an applications test requiring divergent production, and (4) a decision-making test requiring evaluation and judgment. Bentley obtained the following coefficients of correlation:

<table>
<thead>
<tr>
<th>Achievement Measure</th>
<th>Creativity</th>
<th>Miller Analogies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recognition</td>
<td>.03</td>
<td>.47</td>
</tr>
<tr>
<td>Recall</td>
<td>.11</td>
<td>.41</td>
</tr>
<tr>
<td>Divergent Production</td>
<td>.53</td>
<td>.37</td>
</tr>
<tr>
<td>Evaluation-Judgment</td>
<td>.38</td>
<td>.27</td>
</tr>
</tbody>
</table>

In addition to the course examination, students were required to develop an original idea. The ideas were rated by judges by two sets of criteria, one to yield a convergent score, the other to yield a divergent score. The convergent score tended to correlate more highly with the Miller Analogies than with the creativity scores (.38, .16), while the divergent score tended to correlate more highly with the creativity scores than with the Miller Analogies (.25, .19).

Holland notes two deficiencies in the validity studies about the Torrance tests. First, there are too few predictive validity studies. Holland states:

> It is quite possible that a person can give many unusual uses of a brick or cardboard box but fail to perform originally in real life situations. Unless tests like the Torrance Tests of Creative Thinking are tied to reality by studies of external validity, it will never by known whether high scores identify original people or crazy brick layers or packers. The studies imply possible predictive validity, but little real evidence exists.

Second, too many of the validation studies depend on extreme group comparisons without any information about the excluded
middle. However, in spite of these two criticisms of the validity of the Torrance tests, Holland pronounces that they are generally "consistent with the literature of creative behavior" (10). Holland further concludes that the tests appear to have useful reliability and validity for research purposes (10).

It was decided to use four of the activities in Verbal Test A of the Torrance battery: the Product Improvement Test, the Unusual Uses of Cardboard Boxes, the Unusual Questions Test, and the Just Suppose Test. The use of only four of the seven tests in the Verbal A battery is quite in keeping with other researchers in the field (11, 12, 5, 18). These four activities were selected because, apart from entire battery totals, validity and reliability figures have been most often quoted for these four activities.

The Product Improvement Test, regarded by Torrance (13) as one of the most dependable measures in the verbal battery, is a complex task, yielding fluency, flexibility, and originality scores. The subjects are asked to inspect a toy elephant and then to suggest ways to make the toy more fun for children to play with. Torrance claims that the activity has a high degree of face validity, almost always making good sense to teachers, parents, and business men (13). The Unusual Uses of Cardboard Boxes Test is a fairly direct modification of Guilford's Brick Uses Test (7). The subjects are asked to suggest ways to use cardboard boxes. ...
reports that "cardboard boxes" creates in many individuals rigid sets that are difficult to overcome. Thus, the task is in part a test of ability to free one's mind of a well-established set. This type of rigidity seems to increase with age. About 40 per cent of graduate students in education, 34 per cent for a group of college freshmen and juniors, and 17 per cent of a group of fourth, fifth, and sixth graders fell into the category of defining a cardboard box as a container and giving predominately "container" responses for its use (13).

The Unusual Questions Test was adapted from a technique devised by Burkhart (1) of Pennsylvania State University. Although he quotes no correlation figures, Torrance (13) reports that measures derived from this technique correlate rather highly with abstract divergence scores and divergence interest scores. In the Just Suppose Test, the subject is confronted with an improbable situation and asked to predict the possible outcomes from the introduction of a new variable. In order to respond productively to the task, the subject must play with the possibility and imagine all of the things that could happen as a consequence. This kind of thinking seems to Torrance to be highly important in creative behavior, but many individuals are unable to entertain such possibilities. Unlike the other three activities, the Just Suppose Test yields only fluency and flexibility scores.

In order to investigate the relationship between creative ability and the production of novelty beyond Maddi's findings (as mentioned in Chapter I), it was important to select a
reliable, valid instrument that met two conditions: (1) the instrument was to be different from the ones used by Maddi, and (2) the instrument was to assess a dimension of creativity that was consistent with the dimension of novelty. An analysis of the literature indicated that the divergent thinking factors, especially originality, were related to novelty. In light of these requirements, of the reliability and validity figures presented, of Holland's conclusion that the tests appear to be useful for research purposes, and of the rationales of the sub-tests, the use of the Torrance Tests of Creative Thinking in this study was warranted.

Rating of the Student Compositions

Buxton (2) concluded that raters who use a scoring system that they understand, endorse, practice, and periodically check their ratings against may achieve a high degree of consistency in rating compositions. Using Buxton's conclusion as an operational basis, a rater was selected and trained. The author of the present study served as the second rater. Definitions and examples of the figures of speech to be used in the study, all of which were taken from Corbett's (3) analysis of figures of speech, were studied and discussed by the two raters. Copies of themes not used in the study, but written by like subjects on the same topic, were used by the two raters to practice their rating. Practice was continued until an .80 reliability was obtained.
The raters then distributed the 214 themes (107 essays, 107 narratives) into 4 sets: 54 essays, 54 narratives, 53 essays, and 53 narratives. Each rater took a set of essays and a set of narratives. When each rater had completed rating one set of themes, he randomly selected ten from that set for the other rater to score. The second ratings were compared to the original ratings to ascertain the level of agreement in the ratings. In only one case did the agreement fall below .80. In that case, the raters searched out the discrepancies and discussed them until agreement was reached. Since the purpose of checking the ratings of ten of each set of themes was to maintain the high percentage of agreement between the raters, in no case were the original ratings of the ten randomly selected themes changed.

To make the rating procedure more objective, a score sheet for each subject was provided on which a categorical list of the figures of speech used in the study appeared. Also on the score sheet appeared two columns, one for the essay and one for the narrative. As he found a figure of speech in the composition, the rater placed a checkmark in the appropriate column and category.

As a control on the frequency of figures of speech, the ratings were based on the first 225 words in the composition. Although it was true that the themes were assigned to be 300 words in length, it was also true that many fell somewhat short of that number. Thus, to insure that the figure of
speech scores were based on the same length, it was decided
to rate the first 225 words, which was the length of the
shortest theme in the study. Rather than going through the
laborious task of counting each word, the raters used the
common practice of assuming five words to a line and then
counting the lines to determine the number of words in a
composition.

Procedures for Treating the Data

The data for each subject were punched on cards and com-
puted by the North Texas State University Computer Center,
using the programs appropriate to each hypothesis. The .05
level of confidence was used in all computations to determine
significance.

Hypotheses I A, I B, and I C.—The differences between
the mean figures of speech scores of high and low divergent
thinking subjects were tested for significance with a t test,
as computed in the Computer Program S002.1: Simple Analysis
of Variance. (This program yields Fisher's t scores for each
two variables used in the analysis of variance computation.)
The high and low divergent thinking groups were determined
by selecting those subjects whose Torrance Verbal Test A
scores were among the high or low 25 per cent in each of
single factor scores of fluency, flexibility, and originality.

Hypotheses II A, II B, and II C.—Correlation coeffi-
cients, as computed in Computer Program S006: Simple Corre-
lation, Regression, were obtained between the following:
A. total figures of speech scores and fluency scores, flexibility scores, and originality scores,

B. figures of speech scores on the essay composition and fluency scores, flexibility scores, and originality scores,

C. figures of speech scores on the narrative composition and fluency scores, flexibility scores, and originality scores.

Hypothesis III.—The difference between the mean figures of speech scores on the essay and on the narrative composition were tested for significance with a \( t \) test, as computed by Program S002.1: Simple Analysis of Variance.

Summary

Four sub-tests of the Torrance Tests of Creative Thinking, Verbal Test A (Product Improvement, Unusual Uses of Cardboard Boxes, Unusual Questions, and Just Suppose) were administered to 107 college students, enrolled in 4 freshman English classes during the fall semester of 1968 at North Texas State University. Two samples of student compositions, an essay and a narrative, were obtained and figures of speech scores were derived from them by two trained raters who had reached reliability. The data for each subject were punched on cards and computed by the North Texas State University Computer Center, using the programs appropriate to each hypothesis. The .05 level of confidence was used in all computations to determine significance.
CHAPTER BIBLIOGRAPHY


Introduction

The present study was an attempt to investigate the relationships between the incidence of figures of speech and divergent thinking. There is in the literature of creativity an indication that the process of making figures of speech is related to creativity, especially the divergent thinking factors of Guilford (6). Flexibility, a divergent thinking factor, is the ability to "jump" from one class of information to another in search of a variety of answers to a problem (6, p. 15). This "jumping process" is similar to the metaphorical process in which new meanings emerge by the combining of previously ungrouped combinations of elements (20, p. 85). Originality, or novelty, another divergent thinking factor, includes the ability to "bring together seemingly disparate ideas to form a new totality . . . ." (1, p. 129). This explanation of originality is strikingly similar to the metaphorical process. Thus, there seems to be a relationship between the metaphorical process and divergent thinking, or creativity. Maddi (10) proposes that the theory of the need
for novelty, an outgrowth of the Fiske and Maddi (4) activation theory, holds much promise for the investigation of creativity.

Briefly stated, the activation theory posits that persons attempt to maintain a level of activation that is characteristic of them. This level of activation reflects a person's having lived in an environment that provides a moderately varied stimulation, and that, when because of monotony, the activation falls below normal, the person shows evidence of a need for novelty that is expressed in one of three possible ways: (1) the passive appreciation of novelty, (2) the active exploration of the external environment, or (3) the production of novelty (14). Research by Maddi (13, 14) indicates that there is a positive relationship between creativity and the production of novelty.

It was believed that, to investigate this relationship beyond Maddi's findings, other measures of creative ability and production of novelty than Maddi used would have to be selected. It was proposed that if originality and the making of figures of speech are similar in process (5, p. 55) and if originality and novelty are the same divergent thinking factor (1), then the production of figures of speech could be regarded as a measure of the production of novelty. To assess divergent thinking, the Torrance Tests of Creative Thinking were used. Thus, the problem of the study was to investigate the relationships between the incidence of
figures of speech in selected types of pupils' compositions and pupil's divergent thinking, and the bearing of these relationships and the activation theory of creativity on each other.

The 106 subjects selected from the freshman English course enrollments at North Texas State University were given the Torrance Tests of Creative Thinking, Verbal Tests A, and were asked to write two compositions, an essay and a narrative. The test scores and the figures of speech scores on the compositions were tabulated and sent to the North Texas State University Computer Center for computation.

In the study, it was hypothesized that

I. with respect to the mean figures of speech scores on both compositions, on the essay, and on the narrative composition, there would be no significant difference between high and low divergent thinking subjects,

II. there would be no significant correlations between the figures of speech scores and fluency, flexibility, and originality scores.

III. there would be no significant difference between the mean figures of speech scores on the essay and on the narrative composition.

Two statistical techniques were employed to test the hypotheses:

Hypotheses I and III. Fisher's t tests were used to test the significance of the
differences between high and low divergent thinkers with respect to figures of speech scores and between figures of speech scores on the essay and on the narrative compositions.

Hypothesis II. Simple correlation coefficients were obtained, and an appropriate table was consulted to determine the significance of each coefficient.

Findings

After testing Hypothesis I, it was found that high and low divergent thinking subjects differed significantly with respect to figures of speech scores on the narrative composition ($p<.025$) and to the total figures of speech scores ($p<.025$), but did not differ with respect to figures of speech scores on the essay.

**TABLE I**

FIGURES OF SPEECH SCORES OF HIGH AND LOW DIVERGENT THINKING SUBJECTS

<table>
<thead>
<tr>
<th></th>
<th>High Divergent Thinkers (N=27)</th>
<th>Low Divergent Thinkers (N=26)</th>
<th>Fisher's t</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
</tr>
<tr>
<td>Essay</td>
<td>15.70</td>
<td>8.36</td>
<td>13.11</td>
</tr>
<tr>
<td>Narrative</td>
<td>16.51</td>
<td>7.94</td>
<td>12.00</td>
</tr>
<tr>
<td>Combined Essay and Narrative</td>
<td>32.18</td>
<td>12.64</td>
<td>25.12</td>
</tr>
</tbody>
</table>

*P < .025
The testing of Hypothesis II yielded the following sets of correlation coefficients:

(1) between the combined figures of speech scores and

(a) fluency scores, an r of .15
(b) flexibility scores, an r of .16
(c) originality scores, an r of .26 (p < .05)

(2) between the essay figures of speech scores and

(a) fluency scores, an r of .06
(b) flexibility scores, an r of .08
(c) originality scores, an r of .13

(3) between the narrative figures of speech scores and

(a) fluency scores, an r of .04
(b) flexibility scores, an r of .07
(c) originality scores, an r of .20 (p < .05).

TABLE II

CORRELATIONS BETWEEN FIGURES OF SPEECH SCORES AND DIVERGENT THINKING FACTORS

<table>
<thead>
<tr>
<th></th>
<th>Fluency</th>
<th>Flexibility</th>
<th>Originality</th>
<th>Composite</th>
</tr>
</thead>
<tbody>
<tr>
<td>Essay</td>
<td>.06</td>
<td>.08</td>
<td>.13</td>
<td>.10</td>
</tr>
<tr>
<td>Narrative</td>
<td>.04</td>
<td>.03</td>
<td>.20*</td>
<td>.11</td>
</tr>
<tr>
<td>Combined</td>
<td>.15</td>
<td>.16</td>
<td>.26*</td>
<td>.21*</td>
</tr>
<tr>
<td>Essay and</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Narrative</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>*p &lt; .05</td>
<td>N=106</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
In testing Hypothesis III, it was found that there was no significant difference between the mean figures of speech scores on the narrative and on the essay.

**TABLE III**

**FIGURES OF SPEECH SCORES ON THE ESSAY AND THE NARRATIVE**

<table>
<thead>
<tr>
<th></th>
<th>Essay</th>
<th>Narrative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>14.56</td>
<td>14.11</td>
</tr>
<tr>
<td>S.D.</td>
<td>6.21</td>
<td>8.35</td>
</tr>
<tr>
<td>Mean Difference</td>
<td>.443</td>
<td>.475</td>
</tr>
<tr>
<td>t</td>
<td>.475</td>
<td></td>
</tr>
</tbody>
</table>

N=106

A composite divergent thinking score was computed by totaling the fluency, flexibility, and originality scores. A correlation coefficient of .21 (p<.05) was obtained between the composite score and total figures of speech scores. (See Table II). Although he does not recommend using the composite score for research purposes, Torrance (19) himself and other investigators have used a composite score in research. The correlation between the composite score and figures of speech scores is presented for comparison of the findings of this study to the findings of other investigations in which the Torrance Tests of Creative Thinking have been used.
Discussion

Maddi (10) proposed that there is a relationship between creative ability and the production of novelty, and it is this relationship that provides the basis for his contention that the activation theory has promise as a theory of creativity. To investigate this relationship beyond Maddi's work, it was proposed that a similar relationship should exist between other measures of creativity and production of novelty than those used by Maddi. It was further proposed that divergent thinking and the incidence of figures of speech, as assessments of creative ability and production of novelty, would show such a relationship. The findings presented in the previous section support the existence of such a relationship.

It was believed that if a relationship exists between divergent thinking and the incidence of figures of speech, then it is logical to postulate that persons high in divergent thinking ability should differ from persons low in divergent thinking ability with respect to the incidence of figures of speech in their writing of compositions. Based on this postulation, a null hypothesis (Hypothesis I) was formed to the effect that there would be no significant difference between high and low divergent thinkers with respect to the incidence of figures of speech in their compositions. The findings indicate that this hypothesis should
be rejected, for significant differences were found between high and low divergent thinkers on two factors: figures of speech scores on the narrative composition ($p < .025$) and total figures of speech scores ($p < .025$). The differences in figures of speech scores on the essay were not significant.

That high divergent thinkers used more figures of speech in the writing of the narrative than they did in writing the essay suggests that divergent thinkers are able to function more creatively in some kinds of writing situations than in others. Since persons high in the production of novelty tend to function in original ways in unstructured tasks (11), divergent thinkers may perceive the narrative as being unstructured and the essay as being structured. This perception may be due to the practice in schools all over the nation to label the essays as exposition and the narrative as "creative writing." It is possible that writing the narrative suggests a freedom of expression in which highly divergent thinking subjects are able to function creatively.

It was postulated in Chapter I that if originality and novelty are similar factors and if thinking with originality and the making of figures of speech are similar processes, then the incidence of figures of speech could be regarded as a measure of the production of novelty. If the incidence of figures of speech can be regarded as a measure of the production of novelty, then it is reasonable to hypothesize that significant correlations would be found between the incidence
of figures of speech in pupils' compositions and divergent thinking factors, which include originality. A null hypothesis (Hypothesis II) was therefore formed to the effect that there would be no significant correlations between the figures of speech scores and the divergent thinking scores. The findings were somewhat conflicting.

Although the findings show positive correlations between the figures of speech scores and the divergent thinking scores, the coefficients were too low to be significant, with the exception of originality scores. The originality factor correlated .20 (p < .05) with figures of speech scores on the narrative and .26 (p < .05) with total figures of speech scores. These coefficients are much higher than those obtained in a study by Maddi, Propst, and Feldinger (14) in which the production of novelty variable correlated only .03 with originality scores on an anagrams activity. The correlations between flexibility and fluency and figures of speech scores, however, consistent with the correlations obtained by Maddi, Propst, and Feldinger (14), who found the novelty variable to correlate only .10 with the Uses of Bricks flexibility scores and only .09 and .15 with productivity (fluency) scores on the Bricks task and anagrams activity. The correlations obtained by these investigators were contrary to their expectations that significant positive correlations should occur between flexibility and originality and the novelty variable. Maddi, Propst, and Feldinger (14) explained
the low correlations as being attributable to the invalidity of the anagrams and Bricks tasks in the context of the study. That is, the anagrams and Bricks tasks were administered under a productivity set, suggesting that subjects tended to be more concerned with how much they could produce rather than with the originality of their responses.

Such an explanation might well be used to account for the low correlations between flexibility and figures of speech scores and the significant, but relatively low, correlations between originality and figures of speech scores in the present study. Although Torrance has attempted to make the activities in his tests models of the creative process (19), and although it is true that the tasks are relatively unstructured in that they require no particular response from a subject, nevertheless, there is still somewhat of a productivity set in the activities. Considerable emphasis is placed on fluency in the verbal tests. However, that the Torrance tasks are still much more unstructured than the anagrams activity and that the instructions in the Torrance tasks tend to emphasize unusual responses over mere volume of responses probably account for the higher correlations in the present study than those in the Maddi, Propst, and Feldinger study (14).

Another explanation, however, is more likely to account for the relatively low correlations between incidence of figures of speech and divergent thinking. First of all,
provisions were not made in the procedures for counting figures of speech for the exclusion of "dead" metaphors. "Dead" metaphors are figures of speech that have become so engrained in the common language that they no longer serve in a metaphorical capacity. The term arms to mean weapons is an example. Secondly, no originality weighting was given to those figures of speech that were counted. It was possible for a subject to obtain a high figures of speech score by using many figures of speech, none of which were original and none of which indicated the metaphorical ability of the subject. It appears, therefore, that had "dead" metaphors been excluded and originality weights awarded to figures of speech, the correlations would have been higher.

It was mentioned that Torrance does not recommend the use of a composite divergent thinking score for research purposes. However, since he and a number of other investigators (19) have used the composite score in research projects, correlations were obtained in the present study between composite divergent thinking scores and total figures of speech scores. The correlations were obtained so that comparisons with other studies using the Torrance Tests of Creative Thinking could be made. The obtained coefficient of .21 (p < .05) was consistent with results obtained in other studies between composite divergent thinking scores and other criteria thought to be related to creativity. For example, Clark (3), using 177 subjects, and Hamberg (7),
using 241 subjects, both obtained correlations between creative thinking and preference for open structure learning experiences of .24 (p < .01). Torrance conducted a study in which projects developed in college classes were given a Divergent Rating or Inventive Level Rating, which was based on how creative the project was. Torrance (19) reported that the Inventive Level Rating correlated .25 with a composite creative thinking score.

It would appear then that there is a positive relationship between the incidence of figures of speech and divergent thinking, especially with originality. Some further explanation, however, needs to be made of why the coefficients of fluency, flexibility, and divergent thinking scores as a whole, were as low as they were, when they were expected to be much higher.

A further analysis of the findings suggests that the correlations may not give an accurate description of the relationship hypothesized. The findings show that high divergent thinking subjects tend to use significantly more figures of speech than low divergent thinking subjects. It is Maddi’s (10) contention that it is the highly creative persons who are likely to be high producers of novelty. The rejection of Hypothesis I supports this contention. A discrepancy remains, however, between the finding of significant differences between high and low divergent thinkers and
the finding of low correlations between figures of speech scores and divergent thinking factors.

A similar circumstance has occurred in sociometric studies that investigated the relationships between sociometric status and intelligence. Bonney (2) reports that there is almost always a low correlation between the two variables, yet when the extremes of the groups are compared, they are significantly different. That is, high and low status groups differ significantly in intelligence scores; high and low intelligence groups differ significantly in sociometric status. These conditions were suggested to be the product of a threshold phenomenon. Although persons with high intelligence sometimes had a low sociometric status, rarely did a low intelligent person have a high sociometric status. When persons of high intelligence did rank low in sociometric status, the correlation between intelligence and sociometric status was lowered. Thus, the low correlation produced an inaccurate picture of the actual relationship.

It is possible that in the present study, the threshold phenomenon was in operation, causing lower correlations than the true relationship between the incidence of figures of speech and divergent thinking should have obtained. It is likely that some persons high in divergent thinking ability should fail to produce novelty for reasons not attributable to the lack of divergent thinking ability; it is further
likely that persons low in divergent thinking ability are hindered by the lack of that ability from being high producers of novelty.

Another phenomena is possible in explaining the relatively low correlations between divergent thinking factors and the incidence of figures of speech. It was observed in an analysis of the raw data that some of the subjects in the writing of the narrative composition used the entire narrative as an extended metaphor, as in a fable or parable. A person doing this would receive a low figures of speech score even though his production might be highly original, for the figures of speech scores were based on the incidence of figures of speech. Such an occurrence tended to lower the correlations.

In order to be able to attribute obtained differences in figures of speech scores to differences in divergent thinking ability, it was important to determine whether or not the essay and the narrative were different with respect to the incidence of figures of speech used in them. It was reasonable to assume that if divergent thinking and incidence of figures of speech were related, then persons of relatively equal ability in divergent thinking would receive relatively similar figures of speech scores on the essay and on the narrative, and that persons different in divergent thinking ability would receive different figures of speech scores.
As a control then, it was hypothesized that there would be no significant difference between the total figures of speech scores on the essay and on the narrative (Hypothesis I). The statistical testing of this hypothesis included the figures of speech scores of all 106 subjects. Because the scores of the high and low extremes of the group tended to cancel their effect on the mean score of the group, the resulting mean figures of speech score on the essay and on the narrative was in effect the score of the middle group. It was logical to expect that those in the middle group would be relatively similar in divergent thinking ability and that their figures of speech scores would be similar. This expectation was confirmed by the acceptance of Hypothesis III.

However, this finding appears to be in conflict with the finding of Hypothesis I which indicated that high and low divergent thinking subjects were different in figures of speech scores on the narrative, but not on the essay. To be consistent, there should have been significant differences on the essay scores as well as on the narrative. Although it may be speculated that persons of extreme divergent thinking ability function differently in some situations than persons whose divergent thinking scores fall in the middle ranges, the reasons for the apparent conflict between the findings of Hypothesis I and III remain unclear.
Conclusions

Based on the findings and discussions presented in the previous section, several conclusions seem justified:

1. In reference to Hypothesis I, it can be concluded that persons high in divergent thinking ability appear to use more figures of speech in the writing of narrative compositions than in the writing of the essay. It may be that highly divergent thinking persons perceive the narrative as being part of a "creative writing" set and feel more free to write in a creative way. In schools over the nation, it is traditional to consider the essay as exposition and the narrative as "creative writing." It is possible that writing the narrative suggests a freedom of expression in which highly creative persons are able to function creatively.

2. In reference to Hypothesis I, it may be concluded that when the incidence of figures of speech is used as the assessment of creativity, the narrative appears to be a source of data to be used to identify creative persons; the essay, on the other hand, does not appear to be such a source.

3. In reference to Hypothesis II, it can be concluded that, although the reported correlations were relatively low, there is a positive relationship between the incidence of figures of speech and originality, one of the divergent thinking factors. Assuming the incidence of figures of speech to be a measure of the production of novelty, this conclusion is consistent with the conclusions made by Maddi
and Andrews (11) and supports the proposition that creativity and production of novelty are related.

4. In reference to Hypothesis I and II, although the correlations between figures of speech scores and fluency and flexibility scores were too low to be significant, three other findings warrant the conclusion that divergent thinking is related to the production of novelty in the form of the incidence of figures of speech. The three findings are (1) that all correlation coefficients in the study were positive, (2) that a composite divergent thinking score correlated significantly with figures of speech scores, and (3) that high divergent thinkers differed significantly from low divergent thinkers in their figures of speech scores. This conclusion is consistent with the postulation of Maddi, Propst, and Feldinger (14) that spontaneous flexibility, as well as originality, involves an active, internally-oriented form of the need for variety and, therefore, should correlate with the production of novelty.

5. In reference to Hypothesis III, no conclusions seem warranted.

Implications

The problem of the study was to investigate the relationships between the incidence of figures of speech and divergent thinking. It is true that the acceptance and rejection of hypotheses do not necessarily prove or disprove a theory;
however, a theory needs supportive evidence if it is to be worthwhile as a model for research. One of the values of theory is that it provides a frame of reference out of which postulations and hypotheses can be made and in which observed relationships can be embedded. Activation theory offers such a frame of reference for the investigation of creativity.

This study lends support to Maddi's efforts (10) to embed the relationships between creativity and the production of novelty in the larger context of activation theory. The investigation of the relationships between the incidence of figures of speech and divergent thinking and the embedding of these relationships in the context of activation theory have a number of implications for the fields of creativity and of education for creativity.

One implication that activation theory, and the relation of creativity to it (as conceptualized by Maddi), have for programs designed to stimulate creativity in individuals is that for the most part, these programs are faulty, for they do not include any emphasis on the motivating forces of creativity that operate from within the individual. Maddi (10) suggests that any theory of the stimulation of creativity must include an emphasis on the "active push, intention, motivation that leads a person inexorably, at whatever cost, toward creative functioning" (10, p. 333). An analysis of the literature about the stimulation of creative functioning suggests that programs designed to stimulate creativity fall
generally into two categories: those that emphasize the open, free, stimulating environment (17, 18), and those that emphasize the use of problem-solving techniques (5, 15, 16). A theory of creativity based on activation theory and the need for novelty implies that a more important approach to the stimulation of creativity is the identification and modification of the motivating factors of creative functioning. Maddi proposes that the theory of activation includes such a motivating factor: the individual's need for novelty, the intensity of which is determined by the characteristic level of activation, which in turn is determined by the individual's adaptation to his environment.

A second implication that the activation theory and the need for novelty theory have for creativity concerns the role of a stimulating environment in developing creativity in individuals. It is widely thought that a highly varied and stimulating environment would stimulate a person to creative behavior. Torrance (18), for example, concluded that the degree to which first, second, and third graders manipulated objects involved in a problem-solving task was significantly related to their fluency and flexibility scores. He concluded that the manipulation of related objects in a varied environment increases inventiveness. This conclusion seems contrary to Maddi's findings that producers of novelty are not active manipulators of external stimuli, but are moved mainly by internal stimuli or motivation. For one thing, Torrance did
not examine for originality, which is more related to inventiveness than either flexibility or fluency. Torrance did find, in other problem-solving situations, manipulation of the external environment was not significantly related to originality scores, which is consistent with Maddi's findings.

Further, the work of Maddi, Propst, and Feldinger (14) indicates that persons who are high in the production of novelty are motivated not by external stimuli but by internal stimuli. In their study, the subjects who were most affected by the external stimuli were very high in the desire for novelty, but were not high in the production of it. If what Maddi, Propst, and Feldinger (14) found is true, then the role of a stimulating environment in the stimulation of creative functioning must be reviewed. Research by Krech (9) supports the implication that activation theory has for stimulation of creativity. He found that not all the stimuli in a highly varied environment account for the learning changes in rats, that only some of the stimuli were responsible, and that these stimuli seemed to be species-specific for rats. He proposes that language stimuli are the corresponding species-specific stimuli for human beings. Application of Krech's proposition to the stimulation of creativity suggests that species-specific stimuli in a highly varied environment account for the increases that occur in creative functioning. To be consistent with Maddi's findings of the dependence of the high producer of novelty on internal stimuli, one could
speculate that species-specific stimuli, such as language, excite internal stimulation to activity.

A third implication is that the counting of figures of speech in a pupil's narrative composition may be a very simple way of assessing his divergent thinking ability. Such a technique cannot replace the more sophisticated tests; however, tests are time-consuming and expensive. A simple technique of identifying pupils of creative ability in the classroom would be very useful. It is well known that teachers use cues that they have derived from their own observations to place pupils in various categories such as socio-economic status, sociometric status, and intelligence, without having resorted to unwieldy instruments. To be sure, these cues are not as accurate as a sophisticated instrument, but the cues do give indications about the students. The counting of figures of speech in pupils' narrative compositions may serve as a cue for the identification of creative pupils.

A fourth implication is that, since the incidence of figures of speech is related to divergent thinking, training in the semantic processes that underly the making of figures of speech may result in increasing divergent thinking ability. One study (8) found that training in the use of figures of speech did not result in any increase in their use. However, the training in the study was superficial in that it dwelt mainly on the recognition of figures of speech and not on
the underlying processes such as transference of meaning from one word to another, the use of juxtaposition, and the joining of disparate ideas into new relationships.

A fifth implication is that, since there is a relationship between the incidence of figures of speech and divergent thinking, the obsolete notion of the figure of speech as a mere ornament of language reserved for poetry and oratory, which still prevails in the schools, needs to receive less emphasis, and the role of the figure of speech as a more basic language process needs to receive more stress.

A sixth implication of this study concerns teacher preparation programs for public school teachers, both secondary and elementary. If the creative functioning of the individual is a desirable goal of education, then programs designed to prepare teachers for public education must include in the teacher-education curriculum the study of creativity and how it can be developed. If processes such as the making of figures of speech are related to creativity, then the study of language processes such as those underlying the making of figures of speech should be an important part of a creativity curriculum. Such a curriculum might take the form of a separate course offering, or it might take a more behavioristic approach. That is, the teacher education courses might be conducted in such ways that the creative functioning in the potential teachers is increased. At any rate, one implication of this study is
that teacher education programs must prepare its teachers to be able to help pupils to develop in their creative functioning. This implication also extends to programs that, in effect, develop teachers for college teaching.

A seventh implication is concerned with the way that teachers have isolated certain areas of student endeavor as being areas of creativity. Art work and certain kinds of writing such as narrative and poetry are examples. At the same time, other areas are more or less excluded from the creative functioning of the pupils. Most of the content areas exclude creative functioning, and with respect to student composition, exposition, or the essay, is excluded from creative functioning. It is not to be construed that pupils cannot function creatively in these "excluded" areas; however, the nature of the teaching procedures is such that creative functioning is not encouraged. If the creative functioning of individuals is to be developed, then pupils must be encouraged to use their creative abilities in all areas of school life.

In reference to the essay, there is not anything in the nature of the essay itself that hinders creative work. What has happened is that exposition has come to mean to pupils that what they write will be evaluated in such a way that a story or poem they have written will not be evaluated. More explicitly, English teachers do not, in evaluating a student poem or story, mark mechanical errors, organizational flaws, or content by the same standards as they do in evaluating
exposition. Rogers (17) suggests that creativity is not limited to certain areas such as art and music, but is evident in all walks of life, so that a housewife can be creative. An implication of this study, then, is that teachers, when teaching exposition or any other area of student learning, should encourage pupils to function creatively. This implication applies not only to teachers in public schools but also to teachers of college pupils.

Recommendations

Based on the findings of this investigation, the following are recommended:

1. Other hypotheses relevant to the relationships between activation theory, creativity, and language processes, should be developed and tested.

2. Teachers whose teaching situations are not facilitous to sophisticated testing should use the technique of the incidence of figures of speech in pupils' narrative compositions to aid in the identification of pupils with divergent thinking potential.

3. Further investigations of the relationships between figures of speech and creativity should be made, but with modifications of the variables and procedures used in this study. For example, other dimensions of creativity than divergent thinking should be used, and originality weights should be used as well as incidence in assessing figures of
4. The serious study of the role of the figure of speech as an important language process should be included in programs of the teaching of language in the schools, and the treatment of the figure of speech as merely an ornament of language should be either discontinued or relegated to a position of secondary emphasis.

Suggestions for Additional Research

There are a number of research possibilities that seem to grow out of the present study. The following research is suggested:

1. Research into whether and how the characteristic level of activation of an individual can be changed.

2. Research into the effects of a highly varied classroom environment on the characteristic level of activation of a person.

3. Research into Fiske and Maddi's proposition that activation level is the result of the individual's adaptation to his environment. Several questions are not yet answered: can a person adapt himself, and thus his activation level, to a new environment? How long would it take? What factors determine whether a person adapts to an environment?

4. Research using physiological measures of activation level during creative functioning.

5. Research into Maddi's contention that creative persons are moved by internal rather than by external stimuli, using different measures of internal stimuli than those used by Maddi.
6. Research into the relationship between activation level and dimensions of creativity other than divergent thinking, such as evaluation and convergent thinking (6).

7. Research into whether verbal or semantic stimuli, regarded by Krech (9) as species-specific, are more or less effective than physical stimuli in raising activation level and/or in increasing creative functioning.

8. The development of measures of metaphorical ability other than incidence and originality of figures of speech.

9. Research into the precise relation of metaphorical processes to such basic language processes as language acquisition.

10. Research into the relation of incidence of figures of speech to age, sex, and environmental variables.

11. Research into the relationship between figures of speech production and characteristic activation level, as measured by physiological measurements.

12. Research into the use of metaphorical processes by infants and small children.

13. Research into the effects of training in the figures of speech processes on creative functioning.

14. Research into differences between incidence of figures of speech and the making of figures of speech.
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