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CULTURALLY DEPRIVED CHILDREN.

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**A COMPARISON OF MOTOR CREATIVITY WITH VERBAL CREATIVITY  
AND FIGURAL CREATIVITY OF BLACK CULTURALLY  
DEPRIVED CHILDREN**

by

**Dorothy Jean Alston**

**A Dissertation Submitted to  
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The University of North Carolina at Greensboro  
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**Approved by**

  
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## ABSTRACT

ALSTON, DOROTHY JEAN. A Comparison of Motor Creativity with Verbal Creativity and Figural Creativity of Black Culturally Deprived Children. (1971) Directed by Dr. Gail Hennis. Pp 143

The general aim of this study was to determine what relationships, if any, exist between verbal, figural and motor creativity of black culturally deprived children. More specifically, the goal of this study was realized by investigating the tenability of the null hypotheses that state that significant relationships do not exist between 1) the correlation coefficients for girls among verbal, figural and motor creativity, 2) the correlation coefficients for boys among verbal, figural and motor creativity, 3) the correlation coefficients for the total population among verbal, figural and motor creativity, 4) the regression coefficients for girls among motor creativity and a combination of other creativity variables, 5) the regression coefficients for boys among motor creativity and a combination of other creativity variables, and 6) the regression coefficients for the total population among motor creativity and a combination of other creativity variables. Additionally, the goal of this study was realized by investigating the tenability of the null hypothesis that states significant differences between the mean of boys and girls on verbal creativity, figural creativity and motor creativity do not exist.

The subjects for this study were fifty students (twenty-six boys and twenty-four girls), aged ten through twelve, enrolled at Newbold Elementary School, Fayetteville, North Carolina.

Newbold School is located in a predominately black, urban, culturally deprived-class area. The majority of the children enrolled in this school are drawn from this area.

Three instruments were selected to gather the necessary data. The Torrance Tests of Creative Thinking, Verbal Form A and Figural Form A, were used to evaluate creative thinking abilities. The Wyrick Test of Motor Creativity was used to evaluate motor creativity. Data were collected on twelve variables.

Raw scores were converted to T scores for each test item. Collected data were analyzed by telecommunications with an IBM 360, Model 75 computer provided by an IBM data transmission terminal at the University of North Carolina at Greensboro. Intercorrelation matrices were computed to obtain relationships between all pairings of variables for the total population, and for the boys and girls separately. Stepwise multiple correlation and regression analyses were done with motor creativity variables as dependent variables and all other variables as independent variables for the total population and for boys and girls separately. The null hypothesis of no difference between the means of the boys' group and the girls' group was tested by use of multivariate analysis of variance. The .05 level of significance was chosen to test the null hypotheses.

Within the limitations of this study and with specific reference to ten, eleven and twelve year old black culturally deprived boys and girls, the major findings are summarized as follows:

1. The motor creativity and verbal creativity batteries assess similar qualities to a moderate degree for the total population, and the boys and girls separately.
2. There is an apparent lack of relationship between verbal creativity and figural creativity for girls.
3. The variables measured by the verbal creativity and figural creativity test batteries can be used to predict motor fluency for girls.
4. The variables measured by the verbal creativity and figural creativity test batteries can be used to predict motor originality for boys.
5. The variables measured by the verbal creativity and figural creativity test batteries can be used to predict motor creativity for the total population and for the boys' group.
6. There are no significant differences between the mean of the boys and girls with reference to the aspects of verbal creativity, figural creativity and motor creativity.

## DEDICATION

TO MY FATHER AND MOTHER

You knew the true meaning of  
deprivation  
but you never faltered in your  
dedication,  
you wanted for us, my brother  
and me  
a new kind of life, one you  
would never see,  
through sorrow, pain and hunger too  
you struggled and toiled  
for this, I THANK YOU.

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## TABLE OF CONTENTS

	Page
DEDICATION.....	iii
ACKNOWLEDGEMENTS.....	iv
LIST OF TABLES.....	vii
CHAPTER	
I. INTRODUCTION AND STATEMENT OF THE PROBLEM.....	1
Introduction	
Statement of the Problem	
Definition of Terms	
Delimitations	
Hypotheses	
Sample	
Tools	
II. REVIEW OF RELEVANT LITERATURE.....	14
Creativity	
Creativity and Motor Performance	
Motor Creativity	
Creativity and the Culturally Deprived	
Summary of Review of Relevant Literature	
III. PROCEDURE.....	60
Subjects	
Instruments Used in the Collection of Data	
Collection of Data	
Statistical Treatment of Data	
IV. PRESENTATION OF DATA.....	71
Correlations	
Stepwise Multiple Correlation and Regression	
Analysis	
Multivariate Analysis of Variance	
Summary	
V. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS.....	106
Summary	
Conclusions	
Recommendations for Further Study	

<b>CHAPTER</b>	<b>Page</b>
<b>BIBLIOGRAPHY.....</b>	<b>115</b>
<b>APPENDIX A.....</b>	<b>125</b>
<b>APPENDIX B.....</b>	<b>128</b>
<b>APPENDIX C.....</b>	<b>135</b>
<b>APPENDIX D.....</b>	<b>142</b>

## LIST OF TABLES

Table		Page
1.	Intercorrelations of All Variables: Total Population.....	73
2.	Intercorrelations of All Variables: Girls.....	78
3.	Intercorrelations of All Variables: Boys.....	82
4.	Stepwise Multiple Correlation and Regression Analysis with Motor Fluency as the Dependent Variable: Total Population.....	86
5.	Stepwise Multiple Correlation and Regression Analysis with Motor Originality as the Dependent Variable: Total Population.....	88
6.	Stepwise Multiple Correlation and Regression Analysis with Motor Creativity as the Dependent Variable: Total Population.....	89
7.	Stepwise Multiple Correlation and Regression Analysis with Motor Fluency as the Dependent Variable: Girls.....	91
8.	Stepwise Multiple Correlation and Regression Analysis with Motor Originality as the Dependent Variable: Girls.....	92
9.	Stepwise Multiple Correlation and Regression Analysis with Motor Creativity as the Dependent Variable: Girls.....	94
10.	Stepwise Multiple Correlation and Regression Analysis with Motor Fluency as the Dependent Variable: Boys.....	96
11.	Stepwise Multiple Correlation and Regression Analysis with Motor Originality as the Dependent Variable: Boys.....	97
12.	Stepwise Multiple Correlation and Regression Analysis with Motor Creativity as the Dependent Variable: Boys.....	99
13.	Multivariate and Univariate Analysis of Sex on the Verbal Creativity, Figural Creativity and Motor Creativity Traits.....	101

## CHAPTER I

### INTRODUCTION AND STATEMENT OF THE PROBLEM

#### A Little Child\*

I am a child  
I paint fearlessly  
I hammer loudly  
I build recklessly  
I read imaginatively  
I write originally  
I sing rapturously  
May man never quell my creativity,  
just refine it.

Creativity, as described by many writers, is in many respects like the creativeness of all happy and secure children. Young children can perceive more freely because they are not concerned with or have not been exposed to the pressures of conformity. These children can paint a picture, compose a song, dance or game instantaneously, without planning or previous intent. We, educators, have often observed that as children grow older this spontaneous freedom decreases. Does it decrease because we favor group conformity over individuality, negating the novel and different? The answer to this question and similar questions has prompted much of the research in the area of creativity.

Creativity has become an integral part of educational nomenclature. Educators are becoming increasingly interested in the "creative" teacher, the "creative" child, "creative"

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\*From Childhood Education, February 1957, Vol. 33, No. 6

teaching methods, and the "creative" atmosphere in the classroom. Educational researchers are conducting studies in an attempt to determine the extent of education's role in fostering creativity. In addition, tests are being constructed or refined which are designed to assess creative potential. At the same time, many teachers are utilizing new teaching techniques in an attempt to enhance creativity in their classrooms.

Historically, three basic theories concerning creativity penetrated the thinking of man. Each theory was transitional, representing societal trends during its period of dominance. These three theories are the theories of Supernaturalism (18, 23), Neuroticism (1, 12, 75) and Genius (12, 20, 27).

Today, the most prominent theory regarding creativity is the Naturalistic Theory. It regards creativity as the work of normal man, involving all of his psychological system. Creativity is a human factor that is essential for the evolution of man and for his personal growth (26, 31, 32, 40). Proponents of this theory contend that creativity can be taught because the central problems of creativity and education are synonymous (54).

Presently, there is an ideological gap between conservative and liberal educators regarding creativity. Not all educators feel that the fostering of creativity is a school responsibility. On the other hand, many educators feel very strongly that the school plays an important role in fostering creativity. Barzum (43) believes that creativity cannot be a goal of education, for it means that formal education is pointless. He views creativity

as a device by which we give ourselves easy satisfaction while avoiding necessary judgments. Contrarily, Hallman (54) believes that creativity can and should be taught. He states that both education and creativity involve the process of shaping one's surroundings, of relating oneself productively to others; and identifying oneself and defining one's own existence. Studies reported by Torrance (36), Parnes and Meadow (36), and Williams (77) reveal that appropriate educational structure itself discourages the development of creative potential. The most creative children are not the most satisfactory students. They resist group work, are stubborn, often embarrass teachers with wild questions and offbeat ideas. Their humor and playfulness are often unappreciated in the classroom. The need exists for better knowledge of the means by which such children can be identified so that educational programs capable of nurturing their talent and those of children in general can be developed (62).

It is evident that there is a societal need to help the individual child channel his creativity in productive ways. Taylor (30) points out that when the creative potential remains educationally untapped, there is a much greater possibility of its finding outlets in delinquency and destructive behavior.

Supportatively, Torrance (38) states that "when teachers fail to understand highly creative children, refusal to learn, delinquency, or withdrawal may be the consequence". Also Arnold Toynbee (37) asserts that:

When creativity is thwarted, it will not be extinguished; it is more likely to be given

an antisocial turn. The frustrated able child is likely to grow up with a conscious or unconscious resentment against the society that has done him an irreparable injustice, and his repressed ability may be diverted from creation to retaliation.

Today, American society is a mass society. It is characterized by mass communication, mass transportation, mass education, bureaucracy and cultural pluralism. Presently, we recognize the need for individualization within society. In education, individualization of instruction is one way of fulfilling this need. However, we need to know more about man as a functioning, integrated human being before we can adequately provide for his needs. A functional developmental understanding of creativity would significantly add to our comprehensive knowledge of man. Research evidence has indicated that there is little or no relationship between measured creativity and measured intelligence (8, 53, 91, 94, 79). Therefore, creativity is considered a discrete ability or trait separate and apart from intelligence. Also, creativity in motor performance, motor creativity, has been found to be a discrete ability which has little or no relationship to other creative abilities (91, 79).

The continuous playing back and forth between observable data and inferences made from these data provide the basis for functional theory. It enables one to ask questions which subsequently serve as points of reference. This is a continuous process.

Dr. Joseph White (76), Professor of Psychology and Director of the Black Studies Program of the University of California

at Irvine, has questioned the use of what he calls "white theories" in the ghetto for they ignore ghetto life styles. He asserted that:

We are culturally and psychologically deprived because our experiential background provides us with inferior preparation to move effectively within the dominant white culture. . . . If social scientists, psychologists and educators would stop trying to compensate for the so called weaknesses of the black child and try to develop a theory that capitalizes on his strengths, programs could be designed which from the get-go might be more productive and successful.

Supportively, Taylor (30) has inferred that culturally deprived children possess creative potential that remains educationally untapped due to the dearth of information regarding these children.

In light of these theories, it seems appropriate to conduct further research to ascertain additional data which might support the present theories or serve as a basis for the formulation of new theories. It was on this premise that the present study proposed to utilize selected information regarding verbal, figural and motor creativity with black culturally deprived children and to study the results.

Numerous tests have been devised to assess creative thinking but little work has been done to date in assessing motor creativity. Motor creativity has been defined as creativity in motor performance (97). The one Motor Creativity Test available has been recommended for research purposes only; therefore there is no test of motor creativity available for classroom use at this time.



Is creativity a general or specific trait? Can tests designed to measure creative thinking also be used to assess one's motor creative potential? In order to answer these questions, additional information concerning the relationship between creative thinking and motor creativity is required.

The literature reveals a need for additional study of the relationship between creative thinking and motor creativity in order to gain a comprehensive understanding of the nature and scope of creativity and creative potential. Also, the literature reveals that most of research dealing with creativity and the creative potential of children has been limited to white middle class children. The findings of these studies are not applicable to minority groups. Relatively little research has been reported involving children of minority groups. In order to adequately provide for the educational needs of all students, additional research relating to all groups within the educational system is needed.

The right to self-determination and self-expression has become more than just a luxury to the disenfranchised poor and young. The dominance of white cultural norms over the curriculum of most urban schools jeopardizes self-identification, confidence, imagination, motivation, sensation and even the health and equilibrium of the minority student (44).

As more information regarding all students is amassed, insight may be gained which will enable educators to properly provide for the individual creative needs of all students. As

a result all students can be afforded opportunities to discover and utilize their esthetic and creative abilities.

This study proposed to provide a more comprehensive understanding of the relationship between verbal, figural and motor creativity by focusing on these relationships as they exist among culturally deprived black children. It is hoped that this study will make a contribution in stimulating more research in creativity for the culturally deprived student who for various reasons, has been the victim of "benign neglect" in many educational institutions.

#### STATEMENT OF THE PROBLEM

The purpose of this study was to investigate the relationships between motor creativity, verbal creativity and figural creativity of culturally deprived black children.

#### Sub-problems

The sub-problems of this study were:

1. To adapt the Wyrick Motor Creativity Test for use with ten, eleven, and twelve year-old culturally deprived black children.
2. To determine the relationship between:
  - a) motor creativity and verbal creativity.
  - b) motor creativity and figural creativity.
  - c) verbal creativity and figural creativity.
  - d) motor creativity and a combination of other variables.
3. To differentiate between boys and girls on the selected aspects of creativity.

## DEFINITION OF TERMS

For the purpose of this study the following definitions were used:

1. Black - persons of Afro-American descent.
2. Creative elaboration - the ability to produce a more complex idea from a basic idea by adding to the original product.
3. Creative flexibility - the ability to produce a variety of ideas.
4. Creative fluency - the ability to produce quickly a quantity of ideas.
5. Creative originality - the ability to produce unique ideas.
6. 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 and retesting them; and finally communicating the results (95).
7. Culturally deprived children - members of lower socioeconomic groups with a yearly income of less than \$3,000.00 per year.
8. Figural creativity - the production of a quantity of unique and elaborate drawings in response to visual stimulus (91). The scores obtained on figural fluency,

figural flexibility, figural originality and figural elaboration were combined to obtain a figural creativity score.

9. Motor creativity - the combination of perceptions with particular emphasis on the kinesthetic perception into a new and fresh motor pattern. This motor pattern response may be either a solution to a pre-established question or the expression of an idea or emotion by means of the human body (97). In this study it is composed of a combination of motor fluency and motor originality scores.
10. Motor fluency - the ability to produce quickly motor responses in a situation requiring little restriction and where emphasis is on quantity (97).
11. Motor originality - the ability to produce remote, uncommon or clever motor responses (97).
12. Verbal creativity - the ability to produce a number of responses to written or oral stimuli (91). The scores obtained on verbal fluency, verbal originality and verbal flexibility were combined to obtain a verbal creativity score.

#### DELIMITATIONS

1. This study focused on the relationship between motor creativity, figural creativity and verbal creativity of culturally deprived black children.

2. The study was limited by the method of sampling and instrumentation.
3. The sample was drawn in such a way that:
  - a) Only ten, eleven, and twelve year-old boys and girls were included.
  - b) Only black students were used.
  - c) Only students in the Fayetteville school system (Newbold School) were used.
  - d) Only children from families whose yearly income is \$3,000.00 or less were used.

#### HYPOTHESES

This study was designed to investigate the following hypotheses:

1. The correlations for girls among verbal creativity, figural creativity and motor creativity are equal to zero.
2. The correlations for boys among verbal creativity, figural creativity and motor creativity are equal to zero.
3. The correlations in the population among verbal creativity, figural creativity and motor creativity are equal to zero.
4. The differences between verbal creativity, figural creativity and motor creativity of boys and girls are equal to zero.
5. The regression coefficients for girls among motor creativity and a combination of the other creativity variables are equal to zero.

6. The regression coefficients for boys among motor creativity and a combination of the other creativity variables are equal to zero.
7. The regression coefficients in the population among motor creativity and a combination of the other creativity variables are equal to zero.

### SAMPLE

#### Criteria for Selection

1. The student was enrolled at Newbold Elementary School in the Fayetteville City School System during the 1970-71 academic year.
2. The student was black.
3. The student was either ten, eleven, or twelve years old.
4. The student had a culturally deprived background.
5. The student was able to read well enough to take the Torrance Tests of Creativity Thinking.

#### Methods of Selection

Fifty students were randomly selected from a list of students within the school population who met the established selection criteria.

### TOOLS

#### Torrance Tests of Creative Thinking

The Torrance Tests of Creative Thinking were used to assess Verbal Creativity and Figural Creativity. The tests are designed

to assess different aspects of creative thinking in regard to the qualities of creative products. Standardized data for all grade levels have been published and are available for use.

1. Verbal Creativity - the Torrance Test of Creative Thinking - the Verbal Form A was administered once to all subjects.

The following activities were included in the Verbal Test:

- a) ask questions
- b) guess causes
- c) guess consequences
- d) product improvement
- e) unusual uses
- f) unusual questions
- g) just suppose

2. Figural Creativity - the Torrance Test of Creative Thinking - the Figural Form A was administered once to all subjects.

The following activities are included in the Figural Test:

- a) picture construction
- b) picture completion
- c) parallel lines

#### Wyrick Test of Motor Creativity

The Wyrick Test of Motor Creativity was individually administered to each subject. The battery administered included the items reported by Wyrick as the best combinations to evaluate motor creativity assessing both motor originality and motor fluency (97).

**The Test items are as follows:**

- 1. Parallel Line Test M-1**
- 2. Ball-Wall Test M-2**
- 3. Hoop-test M-3**



## CHAPTER II

### REVIEW OF RELEVANT LITERATURE

The general areas of importance to this study were those of creativity and the culturally deprived child. Therefore, this review of relevant literature was limited to the following subdivisions:

1. Creativity - with emphasis on the creative process, levels of creativity, the creativity tests and creative personality.
2. Creativity and Motor Performance.
3. Motor Creativity.
4. Creativity and the Culturally Deprived Child.

### CREATIVITY

There are numerous definitions of creativity. But, there is no one specific definition that is universally accepted at this time. Many of the definitions used in studies pertaining to creativity or creative thinking are operationally defined. Good (11) made the following distinction between creativity and creative thinking:

Creative thinking is thinking that is inventive, that explores novel situations or reaches new solutions to old problems, or that results in thoughts original with the thinker.

Creativity is a quality thought to be composed of a broad continua upon which all members of the population may be placed in different degrees; the factors of creativity are tentatively

described as association and ideational fluency, originality, adaptive and spontaneous flexibility, and ability to make logical evaluations.

Although the above distinction between creativity and creative thinking has been made, much of the literature uses the terms interchangeably.

Various approaches have been used to study creativity. Golann (50) has identified four methods of assessing creativity. They are 1) the evaluation of the product which constitutes level of creativity, 2) the examination of the process, 3) the study of and/or construction of tools designed to measure creativity and 4) personality analysis of the creative individual. Barrett (83) cited a study whereby some fifty definitions of creativity were classified roughly in terms of 1) person, 2) process, 3) press (interaction between human beings and their environment) and 4) products as the embodiment of ideas.

The major areas of consideration in this review of literature pertaining to creativity are 1) The Creative Process, 2) Levels of Creativity, 3) Creativity Tests and 4) The Creative Personality.

#### Creative Process

During all creations, the creative process seems to remain essentially the same regardless of the activity. However, the stages of the creative process have been described in various ways. Many writers use "stages" or synonymous terms to describe the creative process, acknowledging the fact that the characteristics of the process are not separate or distinct but they overlap.

Rogers (31) defined the creative process as the emergence in action of a novel relational product growing out of the uniqueness of the individual on the one hand and the materials, events, people or circumstances of his life on the other. As previously stated, many writers have broken this process down into various stages. The stages involved in each may be different in number and name but with the proper explanation each of the described processes are quite similar.

Crosby (7), Marksberry (24) and Haefele (17) used the same four stages to describe the creative process. The first is that of preparation which involves the restatement of the problem in more effective terms, a decision concerning the direction in which materials should be developed and the activation of the results of this mental analysis toward solution by the manipulation of the materials. The second stage is the incubation stage. This stage is the wait after preparation and is sometimes characterized by frustration. In this stage, the problem weighs on the mind, it keeps recurring, even when one is otherwise engaged. The length of the incubation period varies from individual to individual and from creation to creation. It may be short or long--a few minutes or a few years. The time may be spent in alternative efforts or in relaxation or rest. The end of the incubation is the attainment of insight, the third stage. Insight comes through the senses; visual, auditory, olfactory, kinesthetic, or even in a dream. It is the birth of an idea; thrill of solution and anxiety separation.

It is the answer to the problem posed, the fruit of the preparative labor, the new combination, to fabrication of what is to be communicated. Insight is the distinguishing mark of creative work but the final stage is that of verification, the toil. It is the action that follows the insight, involving elaboration to a rough-finish development and revision. Insight is brief and non-specific, a product of the unconscious, and purely ideational but verification is specific, and is concerned with physical numbers, equipment from experiments, paints, canvas, or a typewriter. The total process of verification involves elaboration, minor insight, minor complete cycles of the creative process to overcome local blocks and revision.

Ghiselin (9) used preliminary labor, period of quiescence, inspiration or illumination and verification as stages in the creative process. Preliminary labor involves a seemingly fruitless struggle for insight in some area of obscurity. It is more than a period of preparation because preparation causes no creative activity whatever. Preliminary labor is a period of trial and error. The period of quiescence is characterized by the spontaneous appearance of fresh insight. It is an incitement of the unconscious mind for further work. The inspiration or illumination stage involves the sudden, spontaneous appearance of new insight, accompanied by feelings of certainty, which are not always valid and of esthetic gratification. Finally, verification involves bringing the product under the pressures of actual circumstances and/or the conditions of reality.

Stein (34) stated that creativity is a process of hypothesis formulation, hypothesis testing and the communication of the results which are the resultant of social transaction. Individuals affect and are affected by the environment in which they live. The early childhood family-environment transaction facilitates or inhibits creativity.

Kaiser Aluminum News (81) describes seven steps that make up the creative process. They are 1) Desire--the person must for some reason want to create something original; 2) Preparation--the individual gathers pertinent or seemingly pertinent information; 3) Manipulation--an attempt is made to find new patterns; 4) Incubation--the problem is dropped and the person turns to something else; 5) Intimation--the feeling of premonition; 6) Illumination--the solution is suddenly revealed; 7) Verification--the new pattern is examined and valued.

One of the most methodical descriptions of the creative process was presented by Osborn (29). He defined seven steps to the creative process: 1) orientation, 2) preparation, 3) analysis, 4) ideation, 5) incubation, 6) synthesis, and 7) evaluation.

Upon completion of an extensive review of the literature concerning definitions of creativity and the creative process, Taylor (93) found that many explanations of the process could be described by the terms 1) exposure stage, 2) interaction stage, 3) closure stage and 4) execution stage. The exposure stage is analagous to Osborn's "orientation", "preparation" and "analysis" steps. It defines the process of receiving environmental

perceptions without immediately evaluating stimuli. The interaction stage may occur at a preconscious or subconscious level, and very likely it will occur when the individual is occupied with a task or activity other than one that is designed to evoke a creative solution. The interaction stage is referred to by other writers as "incubation", "ideation" or "quiescence." The third stage is the "closure" step. It is the moment when all perceived stimuli relevant to the solution are seen as a new whole. They were not stereotyped or categorized as they were perceived. The final stage, the "execution" stage is analagous to the "verification", and "elaboration" stages of other writers. In this stage, the subjective experience is objectified into some interpersonal communication, the form of expression is refined and the solution is evaluated.

Some writers feel that the entire creative process is charged with emotions. Haefele (17) cited Hutchison as taking a somewhat radical position concerning the creative process. He defined the stages as 1) preparation, 2) frustration, 3) achievement and 4) verification. He is cited as having interpreted the frustration stage as deeply serious:

In order to gain some idea of the bewildering variety of reaction of which the creative mind is capable when faced with genuine frustration, we must see the matter against the background of psychiatry. . . . The intuitive thinker is often in a state of problem-generated neurosis or its lesser equivalent tension owing to the practical block set to the immediate fulfillment of his creative desires. At bottom; therefore, we are dealing with situations manifesting conflict . . . such conflict occasions the same sort of personality readjustment as is seen in the

thwarting of any common life interest . . . the individual . . . tries to forget his ambitions, to cut them from awareness. But these dynamic groups of ideas forming a repressed "creative complex" still control the things he sees, determine his moods. The hidden enterprise bobs up in hydra-headed forms producing sometimes inflation of the ego, sometimes over idealization of purposes, sometimes melancholy, anxiety, and fatigue. In extreme cases, even a "conversion" of the emotions of the repressed system into body symptoms may take place. Mild hysteria or neurasthenic symptoms are common. These play up and down the whole gamut from possible disturbance of action, perception, and memory to the most serious disorders.

Taking a different view, Haefele stated that the frustration concept ignores the cases where frustration is lacking, such as the occurrences of creation by chance stimulation; or creation aside from principle purpose; and of solution after a time in months or years that true mental abandonment is at least a practical assumption.

A review of the literature has shown that the creative process involves a series of experiences or part processes, each of which leads directly into other experiences which involves a continuous merging until the whole is realized.

#### Types of Creativity

Several writers have attempted to clear up many misconceptions concerning creativity by defining creativity in terms of the level of the product rather than the process.

Bisner (48) describes four types of creativity in individuals. The boundary pushers are highly creative in original ways. Their work may not always be the most esthetic but frequently it is the most imaginative. They always seem to want

to push to the limits of ideas and objects. The esthetic organizers display their creativity in the highly esthetic way they organize visual qualities. They may never produce any really imaginative ideas but they have a marked sense of esthetic order. The inventors are those who invent new objects by combining products. Finally, the boundary breakers reject the assumptions that everyone else takes for granted and formulate new premises and proceed to develop a radically new system of thought. Each of the types described above is uniquely different from the other three but neither is considered more or less creative than the other.

Marksberry (24) divided creativity into two types, biological creativity and psychological creativity. Biological creativity occurs when all organisms, human beings included, take from the environment what can be used in forming and maintaining life. Psychological creativity distinguishes human beings from other forms of animal life and each individual from all other individuals and gives each individual the privilege of producing various kinds of new products outside the physical self. Psychological creativity is as necessary for complete individual development as is biological creativity, for it meets self protection needs. Marksberry also noted that a hierarchy exists within each type of creativity. Creation on the lower level is more qualitative while creation on the higher level is quantitative. In one instance, the creator is concerned with the depth of the experience rather than the finished product.



Maslow (26) uses primary creativity, secondary creativity and integrated creativity to discuss the types of creativity. Primary creativity comes out of the unconscious which is the source of new discovery--a real novelty of ideas which departs from what exists at this point. It comes easily and without effort as a spontaneous expression of an integrated person. Secondary creativity is essentially the consolidation and development of other people's ideas. A large portion of production in the world, the bridges, the houses, and new automobiles are the products of secondary creativity. Integrated creativity uses both primary and secondary creativity easily and well in good fusion or in good succession. From this type of creativity emerges the work of art of philosophy or science.

Maslow (27) also refers to special talent creativeness and self-actualizing creativeness. He describes the special talent creativeness as the Mozart Type. It is unique in that it seems to be a special drive or capacity possessed by the individual which has little or nothing to do with the rest of his personality. This type of talent does not rest upon psychic health or basic satisfaction. Self-actualizing creativity springs much more directly from the personality. It seems to be kin to the naive and universal creativeness of unspoiled children. It is the tendency to do anything creatively such as housekeeping and teaching. It enables the individual to use the fresh, the raw, the concrete, the ideographic, as well as the generic, the abstract, the rubricized, the categorized and the classified.

In defining creativity, Taylor (93) studied extensively numerous definitions of creativity. He concluded that the host of meanings imputed to the term seems to fall into five "levels" or clusters. The following are descriptions of the five types of creativity identified by Taylor.

1. Expressive creativity. The most fundamental form of creative behavior is described as expressive spontaneity since the behavior is free from prior training and is manifestly unrehearsed. The most important characteristics of this type of creativity are spontaneity and freedom which form the foundation upon which more creative talent develops. It may be illustrated by the expressiveness of young children, brain storming and expressive Psycho-drama.
2. Productive creativity. When the spontaneous acts of children or adults are polished with skill and education the natural behavior may become inhibited but the finish products can be described as resulting from productive skill. The majority of the definitions are of this order. The emphasis is on producing. The object produced, although not discernably different from other similar objects, requires a certain degree of mastery over the environment, of craftsmanship; it is a technological proficiency.
3. Inventive creativity. When a person exceeds mere skill and can manipulate concrete elements in the environment ingeniously, or discovers and combines parts of the environment to solve problems, the form of creativity described is inventive creativity. Here, emphasis is placed on efficiency and ingenuity with available materials and ideas. The individual produces some new items, but the limitations are that no new principle has been produced. Existing materials or ideas are put together in a new way.
4. Innovative creativity. This type of creativity involves relevant and unique variations, modifications, adaptations of an unique idea into an independent creative end-result. A substantial modification is made in an existing

principle which requires a great deal of cognitive flexibility.

5. Emergentive creativity. The most original ideas which are maximally abstract and unapplied require emergentive originality. A principle or an assumption, around which new schools flourish, emerge at a most fundamental and abstract level. What is involved is an ability to absorb the experiences which are commonly provided and from this produce something that is quite different. This is the highest creative level.

Taylor cited examples of how these various forms of creativity have been exemplified by men who have gained stature in each of the forms. Louis Armstrong, who plays music by ear or by native talent, as well as Rousseau, the primitive painter, can be described as creative in terms of expressive creativity. Stradivari who crafted the best violins and those similar to him are creative in terms of productive creativity. Edison, Bell, Marconi and a host of inventors, as well as discoverers such as Magellan, are creative in terms of inventive creativity. Jung and Adler, who modified the ideas of Freud and applied them differently are examples of creativity in terms of innovative creativity. Picasso, Freud and Einstein exemplify creativity at an emergentive level of creativity.

#### Creativity Tests

Tests of Creative Thinking have been reviewed and compared by Goldman (51) and Thorndike (71). Goldman reviewed The Minnesota Test of Creative Thinking (The Torrance Test) and The Guilford Tests of Creative Thinking. These tests and The Getzels and Jackson Tests were reviewed by Thorndike. The tests reviewed

by Thorndike are generally accepted as evaluative devices for the measurement of creativity therefore these tests and studies related to them are investigated.

Guilford (53) developed a factorial approach to the definition of creativity. This factorial concept allowed that once the factors of creativity had been established, the basis for developing means of selecting individuals with creative potentialities became available. Guilford concentrated on 1) identifying factors thought to be associated with creativity, 2) constructing single-factor tests to measure these hypothesized traits and 3) subjecting the results to factor analysis.

Since his original work, Guilford and Associates (78, 53) have continually defined and investigated his hypotheses. In an early study, thirty-one experimental tests, twelve reference tests and six additional reference tests from the Aircrew Classification Battery were administered to 410 Air Force Cadets and Student Air Force Officers. The purposes of the study were to determine methods of scoring the tests and to identify specific cognitive factors. Various scoring methods were used including statistical uncommonness of answers, enumeration of the number of high-weighted responses and cleverness ratings assigned by scorers. The scoring methods proved to be satisfactory and verbal fluency, verbal flexibility, originality, redefinition and elaboration emerged as cognitive factors in the domain of creative thinking. Further studies of this nature were carried out, using both new and revised tests. The results of these tests substantiated the

existence of the factors of sensitivity to problems, fluency, flexibility, originality, penetration, analysis, synthesis and redefinition.

Cline, Richards and Abe (47) used a high school sample to study the Validity of a Battery of Guilford's tests. The battery included the Consequences Test, Word Association, Hidden Figures Test, Unusual Brick Uses and Match Problems. The highly creative students were compared with the highly academic students. The results revealed that those who scored high on the creativity battery also were high in academic performance. The comparison of creativity and IQ, as measured by the California Mental Maturity Inventory, revealed that this Guilford battery measures aspects of intellect not evaluated by the IQ test.

Barron (28) used three of the Guilford tests to evaluate the creativity of 100 adult male subjects. The tests used were 1) Unusual Uses, 2) Consequence B, and 3) Plot Titles B. The other instruments used to gather data were 1) The Rorschach O+, 2) The Word Rearrangement Test, 3) Archromatic Inkblots and 4) The Thematic Apperception Test (originality rating). The results of this study revealed significant relationship between the three creativity measures thus indicating that all three tests measure similar elements. There were no significant correlations between these three tests and The Rorschach O+, Word Rearrangement and Archromatic Inkblots. However, the Thematic Apperception Test (originality rating) correlated at .21 with the Consequence B Test and .26 with the Plot Titles B Test.

Guilford's concepts have undergone considerable modification and at the present time creativity as a separate set of descriptions of mental activity has disappeared. These functions are now included in a broader framework of intellectual activity which Guilford called "Structure of the Intellect" (16).

Getzels and Jackson (8) devised a test designed to measure 1) the ability to structure incomplete perceptual stimuli, 2) quantity of problems derived from numerical data, 3) variations of associations to stimulus words and 4) original and humorous responses to described situations. Some instruments from the Getzels and Jackson Battery were adopted from other sources. Reliability coefficients of internal consistency from .81 to .87 were obtained on the Word Association Test, Uses Test, Fable Test, and Make-Up Problems Test.

A study of students in grades six through twelve was conducted using the individual tests of the Getzels and Jackson Battery and the Binet and Henmon-Nelson Tests (8). Two experimental groups were used. One group was composed of children who placed in the top 20 per cent of the creativity measures when compared with same-sexed peers, but below the top 20 per cent in measured IQ. The second group consisted of subjects who placed in the top 20 per cent in the IQ, but below the 20 per cent on the creativity measures. Low correlations (.13 to .52) were obtained indicating that measured intellectual ability and measured creative ability are by no means synonymous.

The Getzels and Jackson study was criticized because their report was centered around the use of a single atypical school. Torrance (94) used eight partial replications of the Getzels study. His data indicated that the use of only an intelligence measure to determine giftedness would exclude 70 per cent of the children placing in the upper 20 per cent of the creativity measures.

The Torrance Tests of Creative Thinking (TTCT), formerly termed the Minnesota Tests of Creative Thinking, have been extensively investigated by more investigators than any of the other tests designed to measure creativity. Only in The Torrance Tests of Creative Thinking is there evidence of a commitment to careful test construction. These tests represent the culmination of nearly nine years of research by Dr. Torrance and his colleagues.

The Torrance Tests of Creative Thinking consist of four batteries of test activities, Verbal Form A, Verbal Form B, Figural Form A and Figural Form B. Both the figural and verbal forms can be used from kindergarten through graduate school. Certain of the tests within the batteries are adaptation of the Guilford Tests. In addition, the tests are evaluated in terms of fluency, flexibility, originality and elaboration, all of which are generally accepted Guilford named factors of divergent thinking.

The Torrance Tests, Verbal Form A and Figural Form A, were selected for use in this study. Therefore, a more comprehensive

analysis of the literature regarding these tests and studies related to them was undertaken.

Several test-retest studies have been conducted to determine the reliability of Torrance Test of Creative Thinking. Two studies involving the use of all four batteries with the same subjects have been conducted (95).

In the first study, 118 fourth, fifth, and sixth grade children were administered the Verbal and Figural Tests from one to two weeks apart. The reliability coefficients obtained were: verbal fluency .93; verbal flexibility .73; figural originality .05; and figural elaboration .83.

The second study involved fifty-four fifth graders involved in a creative writing experiment. These subjects were placed in two groups, experimental and control. Twenty-eight of the subjects were experimental while twenty-six were controls. The alternate of both the verbal and figural tests were administered to the first group in from one to two weeks apart and to the second group eight months apart. The results of this study were somewhat lower than those reported in the previously cited study. The reliability coefficients ranged from .50 for figural fluency to .87 for verbal fluency. Generally, the coefficients of stability for the experimental group were higher than those for the control group.

Sister Eucharista Dalbec (85) conducted a study designed to evaluate the creative development of forty-three college students. The students were tested with Verbal Form A at the



beginning of their sophomore year and with the Verbal Form A almost three years later. Reliability coefficients of .59 for fluency, .35 for flexibility, and .73 for originality were obtained.

Goralski (89) tested student teachers at the beginning and end of a quarter (ten-week interval) utilizing a battery consisting of most of the tasks included in Verbal and Figural Forms A & B (Ask and Guess, Product Improvement, Unusual Uses, Incomplete Figures, and Circles). Reliability coefficients of .82, .78, .59, and .83 were obtained for fluency, flexibility, originality and battery total. Using essentially the same battery, Eherts (87) reported a test-retest reliability coefficient of .88 for twenty-nine fifth grade pupils with an elapsed time of seven months between the two testings.

Wodtke (79) examined the test-retest reliability of Torrance's Creative Battery using subjects in grades two through five. The creativity battery was administered in the fall and spring with an interval between tests of approximately six months. The results indicated low reliabilities among the creativity tests. The total battery reliabilities ranged from .33 to .79. Wodtke concluded that reliabilities of such low magnitude did not justify the use of these tests at the elementary level.

Most of the research studies concerned with the reliability of the Torrance Tests revealed a high reliability of specific factors. However, a few studies reveal less emphatic results. In addition, most studies showed reliability coefficients to be higher for the verbal batteries than for the figural batteries.

Numerous studies have been conducted in an attempt to determine the validity of the Torrance Test of Creative Thinking. Much of the available research conducted involved construct and concurrent validity of the tests. Very little work has been made available regarding predictive validity. However, it has been reported that several studies in this area are currently being conducted.

Several studies utilizing the concept of concurrent validity have involved the comparison of the personality characteristics of persons achieving high scores on the Torrance Test of Creative Thinking with those who have low scores. Other studies have involved simple correlations between the test scores and other measures.

Torrance (38) analyzed the personality characteristics of the most creative boys and the most creative girls in each of twenty-three classes in grades one through six in three elementary schools. Ask-and-Guess, Product Improvement, Consequences, Unusual Uses, Picture Construction, Incomplete Figures and Circles Test composite scores were used as the criterion measure. Additional data included Intelligence test scores, responses to the Draw-A-House-Tree-Person Test, a set of peer nominations on a variety of creativity criteria, and teacher nominations on similar criteria. The controls were matched for sex, intelligence quotient, race, class (teacher) and age with the highly creative subjects.

Statistical analysis of the two groups, the highly creative child and their less creative controls, reveal three personality characteristics that differentiated between the two groups.

1. The highly creative children had a reputation for producing wild and silly ideas.
2. The drawings and other productions of the highly creative children were characterized by a high degree of originality.
3. The production of the highly creative children were characterized by humor, playfulness and relative relaxation.

Lieberman (55) tested ninety-three kindergarten children utilizing The Product Improvement Test. She hypothesized that there is a relationship between the quality of playfulness in young children's behavior and fluency, flexibility and originality. Each child was rated by two teachers in each of five classes on five aspects of playfulness; physical, social and cognitive spontaneity; manifest joy; and sense of humor. She found that playfulness correlated significantly (from .21 to .26) with fluency, flexibility and originality as measured by the Product Improvement Test.

Studies designed to determine concurrent validity have been conducted even though no generally accepted criteria has been found. Yamamoto (98) administered The Torrance Tests of Creative Thinking to 459 pupils in grades seven through twelve. In addition, sociometric questions aimed at tapping fluency,

flexibility and inventiveness were administered to the same pupils. Raw scores for fluency, flexibility, and inventiveness were correlated with the frequency counts of nominations on the Appropriate Criterion. A statistically significant correlation coefficient of .24 was obtained for the total group. The relationships in the eighth, ninth, and tenth grades were consistently significant while those in the seventh grade tended to be lowest.

Bish (84) used the California Achievement Test scores as criteria to determine the validity of the Torrance Tests of Creative Thinking, Verbal and Figural Forms A. Significant correlations were obtained between the verbal measures and achievement. But there were no significant correlations between the figural measure and achievement. In a similar study, Cicirelli (46) used The Gates Reading Test, California Arithmetic Test and The California Language Test as criterion measures. Cicirelli found statistically significant correlations between verbal measures and achievement and figural measures and achievement.

Studies regarding predictive validity are few in number because of the amount of time required to complete long-range predictive validity studies. Erickson (88) administered The Torrance Test of Creativity to sixty-six high school seniors in 1959. In a follow-up study in 1966, he utilized a check list of creative activities to determine the creative behavior of these students. Erickson's report was based upon the receipt of forty-four returns from the original sixty-six subjects.

The following coefficients of correlation between the creativity measures and the criterion measures derived from the check list were obtained:

Fluency Total .....	.27 significant at the .05 level
Flexibility Total .....	.24 significant at the .05 and .10 level
Originality Total .....	.17 not significant
Elaboration Total .....	.16 not significant

Wallach and Kogan (39) have criticized the manner in which validity coefficients were obtained for the Torrance Tests of Creative Thinking and other standard creativity tests. In addition to their criticism of the approaches used to ascertain validity coefficients, they concluded that existing evidence fails to support the claim that standard creativity tests assess a unified domain of cognitive functioning that is different from that assessed by intelligence tests. They asserted that tests purporting to assess creativity do not reflect anything more than what is already assessed by intelligence tests. They implied that this state of affairs is due in part to the rigid adaption of the test construction model by students of creativity. These models have been successfully used by persons who have constructed intelligence tests. Additionally, they objected to the imposition of time limits, the single answer criterion of a correct response and the competitive atmosphere implied by "Taking a test".

Attempting to rectify what they perceive as deficiencies, they assessed the creative behavior of 151 fifth graders by a

procedure that allowed subjects as much time as desired to complete each test item. The test was introduced as a game that was described to subjects in a way to minimize peer competition. These conditions appeared to be more representative of the conditions under which creative behavior most often occurs. The authors found that 1) The co-variation between scores from intelligence and creativity tests was essentially zero (average of 100r's=.09) and 2) the intercorrelations creativity measures (average of 45r's=.51) provided evidence of two independent dimensions of cognition that can be justifiably called "creativity" and "intelligence".

In reviewing the development of The Torrance Tests, Goldman (51) cited differences between The Torrance and Guilford Tests. The three major differences were that 1) Guilford's tests were designed to identify or represent a single factor rather than complex tests each of which could be scored in several factors, 2) Guilford's tests were largely geared to student populations rather than children and 3) a number of Torrance's tests were non-verbal in order to test children younger than ten years of age.

#### The Creative Personality

Personality is an area of major concern within the psychological study of creativity. Research in this area includes the study of motivation of creative behavior and the study of personality characteristics of creative individuals. Attempts have been made to identify personality traits that appear to be

present in the creative individuals that are not present in the non-creative individuals.

Several writers utilizing theoretical descriptive reports have described creativity as an emergent property which matures as the individual attempts to realize his fullest potentials in relationship to his environment. Maslow (26) believes that creativity stresses first the personality rather than the achievements. It stresses characterological qualities of boldness, courage, freedom, spontaneity, perspicuity, integration, self-acceptance, all of which makes possible the kind of generalized self-actualizing creativeness, which expresses itself in the creative life or the creative attitude of the creative person.

According to Rogers (31), the mainspring of creativity appears to be man's tendency to actualize himself, to become his potentialities. This is the directional trend which is evident in all organic and human life--the urge to expand, extend, develop, mature--the tendency to express and activate all the capacities of the organism, to the extent that such activation enhances the organism or the self.

These writers placed emphasis on the importance of openness to experience rather than premature conceptualization and upon internal evaluation rather than external evaluation. Supportatively, Rugg (32) contends that man must be free to create as he wishes, not as others wish, in order to experience self-realization. He asserts that censorship thwarts the actualization and smothers creativity.

In a study designed to assess personality differences between highly creative scientists and those who were less creative, Chambers (45) included the Maslow Security-Insecurity Inventory in his battery of personality tests. This inventory was included to test the hypothesis (32, 31, 75) that there is a definite relationship between creativity and mental health. The study did not support the hypothesis that creativity is associated with the highest level of mental health.

For this study, Chambers used 400 chemists and 340 psychologists as subjects. These subjects were divided into matched creative and non-creative groups. Instruments used in addition to Maslow's Security-Insecurity Inventory were 1) an Eighty-one Biographical Inventory, 2) the factors of dominance, enthusiasm, adventurousness, and self-sufficiency from Cattell and Stices Sixteen Personality Factor Questionnaire, and 3) the Initiative Scale from Ghiselli's Self-Description Inventory.

Additional findings of this study were 1) that creative scientists were more dominant than control scientists and that they had more initiative, 2) that none of the personality tests was able to differentiate between experimental and control groups, 3) that the creative group tended to spend more hours during the week in their professional interest and evidenced stronger motivation, 4) that the creative group showed little or no preference for religion and had few if any commitments to civic or community affairs and 5) that the creative group was not overly concerned with others' views or with obtaining



approval for their own work. This sophisticated study supports Roes' (63, 64) findings in previously conducted studies.

Barron (42) reported that highly creative individuals as measured by the Welsh Figure Preference Test-BW Scale described themselves as gloomy, loud, unstable, bitter, cool, dissatisfied pessimistic, emotional, irritable and pleasure seeking. In contrast, the less creative subjects described themselves as contented, gentle, conservative, unaffektive, patient and peaceful.

The findings of a later study conducted by Barron (3) generally provided implications that creative persons have a non-yielding attitude in contrast to a conforming attitude. In addition, they have a preference for complexity and the asymmetrical in contrast to simplicity. Creative persons were more independent in their judgment, more dominant and more self-assertive. Barron concluded that creativity may be studied with regard to personality organization and that a creative person possesses a disposition toward originality.

Stein (33) reported that creative subjects were more cautious and realistic, were more consistent in their desires for rewards, had a more differentiated value-hierarchy, and regarded themselves as assertive, authoritative, and possessing leadership ability. The less creative regarded themselves as acquiescent and submissive. In addition, a negative relationship between rated creativity and socio-economic as well as educational status of the parents was reported. Creative subjects were more likely to feel that their parents were

inconsistent in attitudes towards them. Less creative subjects were more likely to engage in group activities in childhood while the more creative preferred solitary activities. Creative subjects saw themselves as more autonomous, as different from their colleagues, and as having more integrative attitudes.

Myden (59) investigated personality characteristics involved in creative production. He selected a highly creative group of twenty subjects from the "top rank" in diverse fields of painting, writing, composition and choreography. These subjects were compared to an equated group of twenty successful and professional individuals. The tests used were the Bender-Gestalt, Rorschach, Thematic Apperception Test, Human Figures Drawing and the Vigotsky Concept Formation Test. The creative subjects were found to use greater amounts of primary thought process without increase in anxiety, to produce fewer signs of depression, and to possess a higher degree of basic primary effect to external stimuli. One large difference between the two groups was noted to be a significantly stronger sense of psychological role-in-life characteristic of the creative group. Myden described them as inner-directed and not easily swayed by outside reactions and opinions.

Torrance (38) examined a number of studies regarding the personality of the creative individual and compiled a list of eighty-four characteristics which differentiated the creative personality from the less creative one.

### CREATIVITY AND MOTOR PERFORMANCE

Physical education classes provide unlimited opportunities for stimulating creativity. There is both art and science in our discipline and perhaps we have been too often concerned with the science to the exclusion of the art which emphasizes both the creative and the beautiful (41).

Smith (69) feels that creative experiences benefit the individual by freeing him to feel comfortable about using his body as an instrument for expression. It may also serve as a catalytic agent which hastens the process of self-motivation in the improvement of performance. Contrasting the creative painter and the creative mover, she states that the painter who wishes to express an idea or emotion through the use of paint is motivated to improve his skill in brushwork so that his creative expression may be achieved in the way he wishes. Likewise, the student who has created a game, swimming routine, dance or movement phase of any kind will be motivated to improve the performance of the skills which are necessary for the achievement of the desired expression.

Loeffler (57) feels that the student must be given an opportunity to freely and creatively express what she thinks and feels about physical activity in terms of her own involvement. The dancer, she adds, becomes involved in the process of creating form. And, it is the process of creation and expression in which the artist finds meaning. But not everyone enjoys creating forms such as that found in dance. Just as there are

individuals who are less "competitively organized", so are there individuals who are less "creatively organized".

If creativity is important in motor performance, how can it be fostered? What changes should be made in relation to present teaching methods? Allen (41) suggests that instruction primarily consist of suggestion, stimulation and recognition rather than direction, pattern setting and specific detail. Also, Torrance (74) urges us to encourage curiosity and other creative characteristics in our teaching. However, all this does not mean that such instruction is free of structure. All learning experiences should be structured allowing freedom "To let the child find his way" (41).

These writers have given attention to the role of creativity in learning. They suggested that physical education provides the setting for perfecting skills and freeing individuals to move, making it possible for creativity to emerge when a creative environment permits it.

Experimentation involving motor performance and creativity utilizing other artistic means for expression has been done. This method was used to increase the student's understanding of creativity and its relationship to motor performance.

Smith (69) experienced considerable success in having students discover the relationship of art to movement and movement to art by proceeding swimming choreography with chalk paintings.

Loeffler (57) asked students enrolled in an experimental body mechanics class to express non-verbally their thoughts

about some movement activity which held either positive or negative meaning for them as a result of direct participation. The purpose of this project was to stimulate individual creativity and to increase understanding. The projects received were done in paint, clay, needlework, wood and wire. In essay form, she received direct testimony from students stating that their knowledge and understanding of physical education as an art experience had been enhanced during the semester.

A review of the literature cited above reveals that there is a dearth of empirical evidence concerning the relationship or involvement between creativity and motor performance. But, the empirical evidence outweighs the scientific evidence. Very little research has been done on the relationship or involvement between creativity and motor performance.

Torrance (74) studied the effect that movement education had upon verbal creativity scores. He administered The Minnesota Tests of Creative Thinking (non-verbal Form B) to first and second grade classes that had been working in creative movement and a third grade class that had just started work in creative movement. The test battery included picture construction, incomplete figures and closed figure tests.

He found that almost one-half of the first and second graders achieved scores that exceeded the mean for the fifth grade on measures of fluency, flexibility, originality and elaboration. Not one of the forty-two third graders just beginning the creative movement class achieved a score that reached this level. After

about four months of work in creative movement, the third graders were re-tested. They showed dramatic growth in fluency, flexibility, and originality. Only the ability to elaborate failed to show a statistically significant gain. He concluded that performance on creativity paper and pencil tests can be improved by instruction in creative movement education. Torrance did not report the use of a control group thereby ignoring maturation processes, an aspect of internal validity which may have confounded the interpretation of the results.

A limited number of researchers have focused their attention on the relationship between verbal creativity and motor ability--an aspect of physical performance.

Stroup and Pielstick (70) evaluated sixth grade boys in an attempt to determine whether a portion of the variance in creativity measures might be associated with motor skills. Selected creativity tests from the Torrance Test--Torrance Circles, Product Improvement, Unusual Uses, and Consequences Tests--were administered to ninety-seven sixth grade boys. One year later the Iowa Revision of the Brace Motor Ability Test was administered to the subjects. They found no significant relationships between creativity factors and general motor ability as measured by the Iowa Revision of the Brace Test. The authors attributed their negative findings to 1) Testing Procedure--the year's interval between the administration of the verbal creativity tests and the motor ability test, 2) The Validity of the Testing Instruments--the failure of both types of tests

to measure accurately the attributes under discussion and 3) Muscular Coordination Requirements--the difference in muscular coordination requirements of the motor ability and the verbal creativity tests. Finally, they inferred that specific measures of motor ability or skill might be related to creativity even though general motor ability does not seem to be.

Barrett (83) conducted a study to determine what relationship if any existed between creative thinking ability and achievement in selected motor skills for fourth, fifth and sixth grade boys and girls. Three hundred and sixty-two students enrolled in a large suburban elementary school in Western New York State were studied. The five instruments used to gather data were two forms of The Lorge and Thorndike Intelligence Test, a verbal and non-verbal battery, The Latchaw Motor Achievement Tests for fourth, fifth and sixth grade boys and girls, and verbal and non-verbal forms of the Minnesota Tests of Creative Thinking. The evidence showed that creative thinking ability and athletic ability, in terms of achievement scores in tests of skill, are essentially unrelated. Only one significant relationship of very low magnitude was found. Therefore she concluded that skill in sport type tasks is essentially unrelated to creative thinking ability.

#### MOTOR CREATIVITY

Some researchers, in the fields of physical education and dance, have focused their attention upon tools designed to measure motor creativity. Using eleven college graduates attending a

three week workshop in dance, Withers (96) attempted to measure the creativity of modern dancers by the use of Guilford's Verbal Creativity Tests. Eight verbal tests designed to measure sensitivity to problems, spontaneous flexibility, adaptive flexibility, closure, originality, associational fluency, redefinition and ideational fluency were administered to the subjects. Additional purposes of this study were to design movement performance tasks, to construct a judges' evaluation sheet for judging the movement tasks, and to compare the findings of the verbal tests with the performance task ratings of the judges. The movement tasks were constructed to measure factors of creativity similar to those measured on the verbal tests. The evaluation sheet included 1) overall creativity, 2) sensitivity to the problem--ability to see and understand the problem in terms of dance, 3) originality--ability to find unique, imaginative, fresh ideas and movement, 4) conceptual unity--ability to conceive, develop and complete an idea, 5) penetration--ability to go beyond the obvious and give a depth of interpretation to the idea and movement, 6) appropriateness--ability to select specific movement suitable to the expression of the dance idea, and 7) technique--ability to use the body in a versatile manner.

The performance tasks included the composition of a dance with a Haiku poem as a stimulus, the composition of a phase of dance technique, and improvisation to a visual stimulus. Judges rated the subjects as they performed individually. Subjects were then ranked on each of the movement tasks and the total movement score. Significant correlations were found between 1) the Plot



Titles Test and performance rankings on originality, 2) between the overall creativity rankings and the technique rankings and 3) movement task number one and the total score of all movement tasks. As a result of these data, Withers concluded that there is a possibility of measuring the creative ability of dancers utilizing verbal tests that are being used as predictors of creativity in other arts and sciences. In addition, she hypothesized that technique is necessary for creative expression, and that this implies a greater freedom for creative expression.

The conclusions drawn from this study are limited by the number of subjects involved in the study, the selection of the judges and the creative status of the subjects.

Wyrick (97) developed a test battery designed to differentiate, for comparative purposes, levels of individuals' abilities to produce motor responses to a task of a problem solving nature. Open-ended problems are presented to the subjects who must then respond in a variety of ways within the structure of the problem situation.

Four tests were devised for each of four types of movement motivator (balls, balance beam, hoop, and parallel lines) making a total battery of sixteen tests. Two tests for each type of motivator were administered on one day and alternate forms of the two tests for each type were administered on the following day.

Test reliability was ascertained by investigating the temporal stability of tests as measured by the day-to-day

correlations, and the within-day reliability as measured by the split-half method. In terms of temporal stability, each test of Day I correlated poorly with the other two tests of Day II that utilized the same motivator. In addition, the total score of the eight tests administered on Day II correlated only .30 with the total of the score of the eight tests administered on Day I. In terms of internal consistency, the Day I tests provided a split-half reliability coefficient of .89 and Day II tests provided a split-half reliability coefficient of .94. When the Spearman-Brown formula was applied to estimate the reliability of a test twice as long, the total of all tests on one day, the split-half reliability coefficients increased to .93 and .96 respectively.

Only the data derived from Day I were considered in the final phase of test selection because the temporal stability of the Day I and Day II batteries as a whole was not significant. In addition, the use of only Day I data minimized the intervention of factors that could confound the results such as intersubject variance attributable to recall ability, concentration, perseverance and motivation.

A Stepwise Regression Technique was employed to determine the best possible combination of test items to be used to predict total scores. A multiple regression coefficient of .97 was obtained from a battery comprised of three test items administered on Day I. These tests included the parallel lines test A-1, the ball-wall test A-5 and the hoop test A-7. The coefficient

obtained indicated results very nearly as effective as those that might be obtained from the total score of eight tests.

Following the selection of tests A-1, A-5 and A-7 from Day I to comprise the Final Motor Creativity Test Battery, a further analysis was made to investigate the relationship between motor fluency and motor originality. Test A-1 motor fluency score correlated .94 with motor originality, Test A-5 motor fluency correlated .80 with motor originality, and the Test A-7 motor fluency score correlated .87 with motor originality.

Using the selected creativity battery, Wyrick conducted a study designed to explore the relationship of motor creativity with motor ability, intelligence, and certain factors of verbal creativity. Additional purposes of the study were 1) to determine the relationship between fluency and originality in motor creativity, 2) to determine the relationship between motor creativity responses to motor problems utilizing different movement motivators, 3) to determine if order effects exists in the presentation of motor or verbal tests, and 4) to determine if extent of movement experience affects motor creativity scores.

One hundred and two freshman college women were individually administered three verbal creativity tests, three motor creativity tests and a questionnaire relating to physical education experiences. Motor ability scores were those obtained at the beginning of the fall semester. Scholastic Aptitude Test scores were obtained from the testing and counseling center. Subjects were assigned randomly to one of six groups ( $n=17$ ) and completed the

motor and verbal tests of creativity in the presentation order assigned to that group. Analysis revealed that generally presentation order did not affect scores.

Correlations between motor creativity scores and motor ability, intelligence and verbal were zero. These data failed to substantiate the common supposition that high motor ability is a requisite for motor creativity. The data also failed to support the hypothesis that verbal tests of creativity may be used to predict motor creativity.

Movement experience, interpreted as participation in physical education classes or other similar types of organized activity, did not appear to affect motor creativity. An analysis of variance technique revealed that there was no significant difference between those subjects having had extensive experience in physical education activities throughout Junior and Senior High School, and those subjects having had very little exposure to activity.

Other studies have been conducted utilizing The Wyrick Test of Creativity to determine the relationship between motor creativity and other selected factors. Nelson (90) evaluated seventy-eight freshman college women on motor creativity and the selected aspects of self-actualization, body and self cathexis and movement concept. This study revealed that motor creativity is a discrete ability which is not significantly related to any of the other variables.

Philipp (91) investigated the relationship between motor creativity and verbal and figural creativity and the relationship

between motor creativity, selected motor skills, growth factors and intelligence. Additional purposes of this study were 1) adaptation of The Wyrick Test of Creativity for use with fourth grade subjects, and 2) evaluation of the One-Foot Balance on a Strike Test (Eyes Open) to determine the optimal number of trials needed to obtain a reliable score for nine to eleven year old subjects.

Sixty-five boys and girls from two fourth grade classes served as subjects. The subjects were between the ages of nine and one-half and eleven years. The instruments used to gather data were The Torrance Tests of Creative Thinking, Verbal Form A and Figural Form A, The Wyrick Motor Creativity Test, Fluency Scale, Static Balance Test, Static Strength Test, Explosive Strength Test and an Agility Test. Height and weight measurements were taken at the time of testing, intelligence scores, as measured by the Lorge-Thorndike Test, and age were secured from the school records.

As a result of her findings, Philipp concluded that 1) creativity is not a generalized factor among nine and one-half to eleven year old boys and girls. The child who is capable of one type of creative expression is not necessarily capable of other types, 2) a tendency toward generalization of creativity was found for girls but not for boys, indicating that there are sex related differences in creative production. These sex related differences probably are due to cultural influences, 3) motor creativity does not appear to be significantly related to

motor skills, IQ, or the growth factors of age, height and weight. Thus, motor creativity does not seem to depend upon skill performance, intelligence, or physical development, 4) a combination of weight, figural fluency and figural originality can significantly predict motor creativity for boys, 5) a different combination including verbal originality, figural fluency and figural flexibility can significantly predict motor creativity for girls, 6) the selected motor skill tests do not measure the same aspect of motor ability, 7) grip strength is significantly related to height and weight, and 8) the performance of boys significantly differs from that of girls on the selected motor skill tests. Boys excelled on strength items (grip strength and standing broad jump). Girls excelled on items requiring body control (balance and agility run).

All of the subjects were not tested at the same time of day. Therefore, diurnal variations may have influenced the findings. In addition, the batteries specifically designed to measure the various aspects of creativity were administered on different days. Since there is likely to be high intrasubject variance with regard to any test of a behavioral nature, the administration of the tests within the same testing period should enhance the validity of the test for making comparisons. Finally, Philipp only utilized the fluency scale to assess motor creativity. She hypothesized that there is a high correlation between originality and fluency therefore an assessment of fluency would be adequate in determining motor creativity. However, she used both originality and fluency to assess verbal and

figural creativity for comparative purposes. In a study of this nature when we know so little about motor creativity, it seems appropriate to utilize all of the known aspects of the phenomenon.

#### CREATIVITY AND THE CULTURALLY DEPRIVED

All children are potentially creative. If creativity is the quality of being able to produce original ideas or work, each new awareness illuminating a child's mind as he develops is an original one. Each new relationship he makes between things that he knows is a creative act. Each beautiful composition he shapes is an original one because he adds a touch, an extra curve, or a splash of color that makes it different from all others (56).

The culturally deprived child has been learning prior to coming to school. He has been learning to control his environment. He has become aware of dangers--people fighting, matches, cars at the curve, leaning out the window, and rats. He has developed concrete appreciations of soap bubbles, penny candy and riding buses (56). Many so-called culturally deprived youngsters have developed a kind of mental toughness and survival skill, in terms of coping with life. They may not be able to verbalize it but they have already mastered what existential psychologists state to be the basic human condition; namely that in this life, pain and struggle are unavoidable and that a complete sense of one's identity can only be achieved by both recognizing and directly confronting an unkind and alien existence (76).

Most observations and studies of culturally deprived children have concentrated on their disabilities in verbal areas of the elementary-school curriculum. Few studies have emphasized strengths in non-verbal areas that may be reinforced thereby enhancing learning for these children.

From early studies, a perceptive picture has been drawn of personality characteristics that culturally deprived children develop to meet the challenges in their world. Several researchers (30, 2, 10) have agreed that disadvantaged children are more spontaneous in their behavior and acts, less conforming, more independent of their parents, and more highly developed in motor skills than children from more advantaged families. Only the characteristics of originality and fluency are missing to complete the picture of the creative child. Rogers (67) asserts that clues in research tend to indicate that disadvantaged children, if taught to use the creative process, are more likely to be fluent producers of ideas than the advantaged child.

Research evaluating the originality and the fluency of culturally deprived children is sparse. With the exception of a few studies the culturally deprived child has generally been left out of research on creativity.

Rogers (92) postulated ten hypotheses to test ex post facto differences in drawing abilities, originality, fluency, aesthetic judgment and the ability to improve drawing after a period of teaching.



Pupils of four elementary schools in disadvantaged and advantaged areas were selected as subjects. The Torrance Test of Creative Thinking and The Meier Art Judgment Test were administered to 454 fifth and sixth grade pupils.

After testing, 125 pupils were randomly selected and organized into four groups classified by grade level and economic status.

Three judges were selected who developed criteria and scales for rating the drawings of pupils. All tests were rated and scored by judges. Disadvantaged pupils were compared to advantaged pupils in ex post facto differences and growth after being taught.

The findings of this study revealed that 1) advantaged pupils were superior to disadvantaged pupils in ex post facto tests in drawings on four to six drawing abilities, 2) the drawing abilities of aesthetic line quality and use of depth in pictures were not significant, 3) disadvantaged pupils were superior to advantaged pupils in figural fluency, 4) there was no significant difference in figural originality and, 5) there were no significant differences in aesthetic judgment.

Rogers concluded that disadvantaged pupils in the population were equal to, or superior in visual creativity despite the handicap of poor drawing ability. And, disadvantaged pupils indicate strengths in visual abilities and illustrate the ability to grow in drawing ability with teaching.

Duke (86) studied the relationship of anxiety, self-concept, reading achievement, and creative thinking of four

socio-economic status levels. The Reeder Adaption of the Brown-fain Categories Inventory, and The Minnesota Tests of Creative Thinking were administered to boys and girls of four socio-economic status levels. The two middle socio-economic status levels achieved significantly higher scores than the lower socio-economic status levels on verbal creative fluency, verbal creative flexibility and verbal creative originality. There were no significant differences among the four status levels regarding creative elaboration. Creative thinking and self-concept were significantly correlated in two areas of creative thinking but no relationship existed between self-concept, creative flexibility and originality.

Taylor (30) has some novel ideas about the untapped creative potential in culturally deprived children. He believes that these children are not nearly so non-verbal as is generally thought. According to Taylor, they use words in a different way and are not dependent on words for their sole form of communication, but that nevertheless they are imaginative at the verbal level. Their wide range of associations indicates a freer use of language, which may be an important attribute of one type of creativity. Taylor contends that not only do studies of creative people indicate that they have greater "semantic flexibility" but also that they respond well to visual, tactile and kinesthetic cues. In general, their non-aural senses seem to be especially acute.

The culturally deprived child has a cognitive style or way of learning that includes a number of features that have

unique creative potential: his skill in non-verbal communication (he is not word bound), his proclivity for persisting along one line (one track creativity), his indication emphasis on many concrete examples, and his colorful free association feeling for metaphor in language, perhaps best seen in the use of slang. The potentialities, indigenous of his cultural heritage, must be fully explored in any program concerned with developing talent among underprivileged groups (30).

#### SUMMARY OF REVIEW OF RELEVANT LITERATURE

There is a plethora of creativity definitions; however, a comprehensive definition encompassing all of the ramifications of this phenomenon is non-existent. Recent researchers have contributed much toward the understanding of many aspects of creativity. Attempts to define or to acquire a more comprehensive understanding of creativity, have resulted in the study of the creative process, creative product, creativity tests and the creative personality.

Writers who examined creativity in terms of the process have described various stages of the creative process. A review of the literature has shown that the creative process involves a series of experiences or part processes, each of which leads directly into other experiences. There is a continuous merging until the whole is realized. Although many writers have broken this process down into various stages, the stages involved in each, though different in number and name, are essentially the same.

Some writers have assumed that creativity is a unitary trait which is distributed in the population in the same manner as other traits such as intelligence and personality. They utilize the product as criteria of creativity. After the products have been judged creative, terms describing the behavior that produced them have been devised. In addition, the individuals who performed the behavior can be classified as possessing to some degree the trait of creativity. These writers have attempted to define or describe creativity of levels or types of observable creativity.

Other writers attempted to define and describe creativity in terms of personality. The factorial concept of personality, introduced by Guilford, has been the focus of considerable inquiry. Personality is considered as an individual's unique pattern of traits and the creative personality is one which exhibits those patterns of traits characteristic of creative persons. Studies related to the creative personality revealed personality characteristics which differentiated the creative personality from the less creative one.

Guilford, Getzels and Jackson, and Torrance have devised measuring instruments consisting of a number of distinct tasks which are thought to involve the creative process. Individual responses to the situations called for are examined for evidences of various factors. Many of the experimental studies designed to assess creativity and creative potential have used these tests as their tools. However, only in the Torrance Tests is

there modest evidence of careful test construction and adequate documentation.

Very little research has been done on the relationship between creativity and motor performance. However, several writers have given attention to the role of creativity in learning physical skills. Experimentation to date reveals that there is little or no relationship between creative thinking and motor performance as measured by motor ability tests.

Wyrick devised a test designed to differentiate for comparative purposes, levels of individuals' abilities to produce motor responses to tasks of a problem solving nature. Presently, this is the only test of motor creativity available for use. And, it is recommended for research purposes only. Studies have been conducted utilizing the Wyrick Test of Motor Creativity to determine the relationship between motor creativity and other selected factors. These studies revealed that there is little or no relationship between motor creativity and creative thinking.

Most of the research in the area of creativity utilized middle class subjects. Very little work has been done in which culturally deprived children were used as subjects. Writers have theorized that the culturally deprived are more creative in the non-verbal areas. However, they are not nearly as non-verbal as is generally thought for they are imaginative at the verbal level. In addition, culturally deprived children are more visually creative than their middle class peers. They are more likely to possess one-track creativity, the ability to

relentlessly pursue one line of thought for long periods of time. This kind of creativity is similar in some respects to Guilford's divergent type.

## CHAPTER III

### PROCEDURE

The procedures used in conducting this study are reported in four parts:

1. Subjects
2. Instruments Used in Collection of Data
3. Collection of Data
4. Statistical Treatment of Data

### SUBJECTS

The subjects for this investigation were fifty ten, eleven, and twelve year old students of both sexes who were enrolled in the Newbold Elementary School at Fayetteville, North Carolina during the academic year 1970-71. These students were randomly selected from a list of students within the school population who met the established criteria for selection of subjects which included: 1) the student should be either ten, eleven or twelve years old, 2) the student should be black, 3) the student should have a culturally deprived background, and 4) the student should read well enough to take the Torrance Tests of Creative Thinking.

The school from which the subjects were selected has been declared culturally deprived by the Federal Government. The majority of the students enrolled come from families whose yearly income is less than \$3,000. In addition, these students

participate in a free lunch or reduced lunch program designed for culturally deprived children.

The investigator was not permitted to evaluate the students' records in order to determine if they were culturally deprived. The records were evaluated and a list of students who met these criteria was compiled by the principal and a grammar grade teacher at Newbold School. This list was given to the investigator who used a table of random numbers to select the subjects for this investigation.

#### INSTRUMENTS USED IN THE COLLECTION OF DATA

Three different instruments were selected to gather information needed for comparison purposes. Creative thinking abilities were assessed with The Torrance Tests of Creative Thinking, Verbal Form A and Figural Form A. Motor creativity was measured by The Wyrick Test of Motor Creativity.

#### The Creative Thinking Tests

Both Verbal Form A and Figural Form A of The Torrance Tests of Creative Thinking were given to all subjects.

Verbal Form A. This battery consists of seven parallel tasks. The first three tasks constitute The Ask and Guess Test in which the subject is asked to look at a picture and to 1) ask questions about the picture that could not be answered by merely looking at it, 2) to make guesses about the possible causes of what is happening in the picture, and 3) to attempt to make guesses as to the consequences of the behavior depicted in the picture.



The fourth task in the battery is Product Improvement. A small stuffed toy elephant is the stimulus. The subjects are asked to think of as many clever, interesting and unusual ways as they can to make the elephant more fun to play with.

The fifth task, Unusual Uses, has cardboard boxes as stimuli. The subjects are instructed to think of as many interesting and unusual uses as they can for cardboard boxes. Cardboard boxes also serve as stimuli for the sixth activity, Unusual Questions. The subjects are asked to think of as many questions as they can about cardboard boxes.

The final task is Just Suppose. An improbable situation is presented to the subjects and they are asked to list the consequences of this event. The improbable situation in the case was - Just Suppose clouds had strings attached to them which hang down to earth. What would happen?

The scoring manual provides directions for extracting scores for the various factors involved in creative thinking. Tasks are scored for fluency, flexibility and originality.

Figural Form A. The figural battery of the Torrance Tests of Creative Thinking consists of three different tasks, Picture Construction, Picture Completion and Lines.

The first task, Picture Construction, uses green colored paper in the form of a curved shape as a stimulus. The subjects are asked to remove the curved shape green colored paper from its original position on page two of the test booklet and place

it on the next page which has a space for a title to be entered. They are asked to think of a picture they can draw which has the shape as an integral part. They are told to keep adding new ideas to the original idea to make it tell an interesting and exciting story. After they complete the picture, they are to think of a title for their picture and write it in the space provided.

The Picture Completion Task consists of ten incomplete figures. The subjects are asked to sketch interesting objects or pictures from these incomplete forms. Additionally, they are told to make their pictures or objects tell as interesting and as complete a story as possible by adding to and building up the original idea. After the completion of each object or figure, they are to think up a title for it and enter this title in the space provided at the bottom of each figure.

The final task, Lines, consists of thirty-seven pairs of straight lines. The subjects are asked to make as many objects or pictures as they can from the pairs of lines with lines as a main part of the picture or object. They are told to make each picture tell as complete and as interesting a story as possible and to record the title for each picture in the space provided.

The tasks of Figural Form A of the Torrance Tests of Creative Thinking are scored for fluency, flexibility, originality and elaboration.

The Torrance Tests of Creative Thinking were selected for this investigation because they appear to be the only tests of

creative thinking that show evidence of careful test construction and adequate documentation at this time. In addition, standardized data for all grade levels have been published and numerous studies have been conducted regarding the validity and reliability of these tests (95).

### Motor Creativity Test

The Wyrick Test of Motor Creativity was individually administered to each subject. The battery administered included the items reported by Wyrick as the best combination to evaluate motor creativity assessing both motor originality and motor fluency (97).

Prior to its use in this study, the battery was administered by the investigator to a group of black culturally deprived children at A & T State University, Greensboro, North Carolina, on July 9, 1970. Reliability coefficients of internal consistency of .80 and .73 were obtained for motor fluency and motor originality respectively. When the Spearman-Brown formula was applied to estimate the reliability of a test twice as long, coefficients of .89 and .84 were obtained. The reliability coefficients for motor fluency of .84 and .89 were not as high as those reported by Wyrick (97). Utilizing two motor creativity test batteries, she reported reliability coefficients of internal consistency of .89 and .94 for motor fluency. Reliability coefficients of .93 and .96 were obtained when the Spearman-Brown formula was used to estimate the reliability of a test twice as long. In Wyrick's investigation, only motor fluency scores were used to determine

test reliability. Reliability coefficients for originality were not computed.

This preliminary study revealed the need for word revisions and the establishment of a three minute continuous running time for all items. A description of the motor creativity test battery as used in this study is included in Appendix A.

The tests in the motor creativity battery were scored for fluency and originality according to the scheme designated by Wyrick (97).

#### COLLECTION OF DATA

The researcher obtained permission to use fifty students at the Newbold School, Fayetteville, North Carolina, as subjects for this study. After approval was secured, a schedule for testing was established.

The testing schedule was established to permit all the tests to be administered to each subject on the same day. This testing schedule was based on:

1. Wyrick's (97) suggestion that the motor creativity test, if used for comparative purposes, should be administered during the same period as other tests of creativity in order to yield valid comparisons;
2. Guilford's (15) premise that validity is coming to be recognized as being much more important than reliability; and
3. The results from a number of studies concerned with the fluctuation of test scores due to day-to-day motivational changes and other experimentally uncontrollable human factors (95).

The schedule was devised in a manner to permit each student to complete his testing on the same day giving special consideration to the time required to administer the motor creativity tests individually to each subject.

The subjects were assigned to one of three groups and each completed the tests on the day assigned to that group.

The tests were administered as follows:

1. Day I (December 15, 1970). The verbal creativity, figural creativity and motor creativity tests were administered to sixteen students.
2. Day II (December 16, 1970). The verbal creativity, figural creativity and motor creativity tests were administered to seventeen students.
3. Day III (December 17, 1970). The verbal creativity, figural creativity and motor creativity tests were administered to seventeen subjects.

#### Administration of the Creative Thinking Tests

The Torrance Tests of Creative Thinking, Verbal Form A and Figural Form A, were administered by the investigator to the three groups separately beginning at 9:00 a.m. on the days specified for each group. All of the subjects in each group were tested at the same time.

The verbal tests were administered first. Each verbal test was administered in the test order specified in the test booklets. A preliminary study revealed the need for a one hour break between the administration of the verbal and figural tests.

Therefore, at the completion of the verbal testing session, the students were given a one hour activity period. One hour later, the subjects began taking the figural tests administered by the investigator. Each figural test was administered in the test order specified in the test booklet.

#### Administration of the Motor Creativity Test

The motor creativity test was begun immediately following the completion of the Torrance Tests of Creative Thinking. The motor creativity test was administered to each subject individually by the investigator and two trained assistants.

At the conclusion of each of the first two testing sessions, the subjects were asked not to discuss their experiences with their classmates until Saturday, December 18, 1970.

#### STATISTICAL TREATMENT OF DATA

The Verbal Creativity Tests and Figural Creativity Tests were independently scored by trained persons employed by the Center of Creative Leadership: Creativity Programs, at Greensboro, North Carolina. The verbal creativity test battery was scored for verbal fluency, verbal flexibility and verbal originality. These scores were combined to derive the verbal creativity score. The figural creativity test battery was scored for figural fluency, figural flexibility, figural elaboration and figural originality. These four scores were combined to derive the figural creativity score.

The motor creativity test was scored by the investigator utilizing the procedures suggested by Wyrick (97). The fluency

score was obtained by tallying the responses of each subject on each test. The sum of the responses was designated as the motor fluency score for the test. The motor originality score was obtained by recording each subject's responses to a test and determining the frequency with which each response occurred in the sample. The responses that occurred only once within the sample were considered original and were given two points. The responses that were made by two subjects were considered semi-original and were valued at one point. Responses that occurred three or more times in the sample received no points. The motor creativity score was derived by combining the motor fluency score and the motor originality score. Raw scores were converted to T scores for each battery item.

Statistical analyses were performed by the computer utilizing programs available in The Statistical Program Library at the University of North Carolina at Greensboro. The programs used in this study were the TSAR program and the MANOVA (APG 1-70) program. These programs were processed by telecommunications with an IBM 360, Model 75 computer provided by an IBM data transmission terminal. The programs used allowed comparisons to be made on the basis of the hypotheses cited on page ten of this study.

### Hypothesis I

Coefficients of correlation were obtained to investigate the relationships of the various factors of creativity to verbal creativity, figural creativity and motor creativity for girls.

### Hypothesis II

Coefficients of correlations were obtained to investigate the relationships of the various factors of creativity to verbal creativity, figural creativity and motor creativity for boys.

### Hypothesis III

Coefficients of correlation were obtained to investigate the relationships of the various factors of creativity to verbal creativity, figural creativity and motor creativity for the total population.

### Hypothesis IV

Multivariate analysis of variance was used to determine the significance of difference between the mean of the boys' group and the mean of the girls' group on all variables.

### Hypothesis V

Multiple correlation and regression analyses with the aspects of motor creativity as the dependent variables and all the other variables as independent variables were used to evaluate the amount of influence that each of the other variables had upon motor creativity for girls. Stepwise regression equations for the prediction of motor creativity from the other creativity scores were utilized for girls.

### Hypothesis VI

Multiple correlation and regression analysis with the aspects of motor creativity as the dependent variables and all the other variables as independent variables were used to evaluate the amount of influence that each of the other variables had



upon motor creativity for boys. Stepwise regression equations for the prediction of motor creativity from the other creativity scores were utilized for boys.

#### Hypothesis VII

Multiple correlation and regression analysis with the aspects of motor creativity as the dependent variables and all the other variables as independent variables were used to evaluate the amount of influence that each of the other variables had upon motor creativity for the total sample. Stepwise regression equations for the prediction of motor creativity from the other creativity scores were utilized for the total population. The .05 level of significance was accepted as the appropriate level for all hypotheses. This selection was determined by the purposes of this study, the social impact of the findings and the error (types I or II) least affecting the meaning of this study.

## CHAPTER IV

### PRESENTATION OF DATA

The purpose of this study was to investigate the relationships between verbal creativity, figural creativity and motor creativity of black culturally deprived children. An additional purpose was to differentiate between boys and girls on the selected aspects of creativity.

Three creativity test batteries were administered to fifty students (twenty-six boys and twenty-four girls) at the Newbold Elementary School, Fayetteville, North Carolina. The Wyrick Test of Motor Creativity was used to evaluate motor creativity. Verbal and figural creativity were evaluated by The Torrance Tests of Creative Thinking, Verbal Form A and Figural Form A.

Parametric statistics were used to analyze the data in terms of the null hypotheses cited on page ten. The statistical techniques used for analyses were a) correlation, b) multiple correlation and regression analysis, and c) multi-variate analysis of variance. All statistical analyses were performed by an IBM 2780 data transmission terminal at The University of North Carolina at Greensboro with a hook up to an IBM 360 computer.

### CORRELATION

Coefficients of correlation were obtained to investigate the relationships among various aspects of creativity on verbal creativity, figural creativity and motor creativity for the total

population, and for boys and girls separately. Coefficients of correlation that were not zero and that were statistically significant denoted some degree of relationship between variables. Correlations have often been considered in such general terms as "high", "moderate", "low", or "insignificant", depending upon the size of  $r$ . Guilford (15) divided correlation coefficients into upper and lower brackets. Correlation coefficients from .70 to .98 were placed in the upper bracket while correlation coefficients from .00 to .80 were placed in the lower bracket. For the purposes of this study, correlation coefficients were categorized as being high, moderate, and low. Correlation coefficients from .80 to .98 were considered high. Correlation coefficients from .40 to .79 were considered moderate. And, correlation coefficients from .00 to .39 were considered low.

#### Correlations for the Total Population

Table 1 depicts the resulting correlation coefficients for the total population on all variables. Investigation of the correlation coefficients between test items on the verbal creativity battery revealed a high relationship between these items. The high relationship between verbal fluency and verbal creativity of  $r=.94$  supports Philipp's (91) suggestion that the fluency score alone would be a good predictor of verbal creativity as evaluated by The Torrance Tests of Creative Thinking. In addition, both verbal flexibility and verbal originality correlated highly with verbal creativity.

The relationships between the figural creativity test items and figural creativity were significant at the .05 level

TABLE 1  
 INTERCORRELATIONS OF ALL VARIABLES  
 TOTAL POPULATION (N = 50)

VARIABLES	1	2	3	4	5	6
1. Verbal Fluency		.86**	.81**	.94**	.34*	.38**
2. Verbal Flexibility			.82**	.91**	.24	.30*
3. Verbal Originality				.91**	.32*	.33*
4. Verbal Creativity					.31*	.36*
5. Figural Fluency						.82**
6. Figural Flexibility						
7. Figural Originality						
8. Figural Elaboration						
9. Figural Creativity						
10. Motor Fluency						
11. Motor Originality						
12. Motor Creativity						
Mean	49.82	50.34	49.62	48.36	51.28	49.02
Standard Deviation	10.39	9.32	10.86	12.55	9.68	9.66

\*  $r > .27$        $p < .05^a$

\*\*  $r > .35$        $p < .01^a$

<sup>a</sup>Values From Wallace and Snedecor's Tables

(Guilford, 1963 pp. 580-581)

TABLE 1 (continued)

VARIABLES	7	8	9	10	11	12
1. Verbal Fluency	.46**	.33*	.43**	.42**	.34*	.45**
2. Verbal Flexibility	.27*	.32*	.37**	.53**	.39**	.50**
3. Verbal Originality	.46**	.43**	.48**	.62**	.54**	.66**
4. Verbal Creativity	.46**	.34*	.42**	.53**	.42**	.54**
5. Figural Fluency	.68**	.29*	.57**	-.04	.17	.11
6. Figural Flexibility	.70**	.19	.54**	.08	.25	.22
7. Figural Originality		.60**	.85**	.34*	.57**	.56**
8. Figural Elaboration			.91**	.29*	.57**	.55**
9. Figural Creativity				.29*	.61**	.57**
10. Motor Fluency					.71**	.87**
11. Motor Originality						.92**
12. Motor Creativity						
Mean	50.24	50.38	53.64	49.06	47.46	50.36
Standard Deviation	9.31	10.19	9.48	11.60	10.56	9.55

\*  $r > .27$   $p < .05^a$

\*\*  $r > .35$   $p < .01^a$

<sup>a</sup>Values From Wallace and Snedecor's Tables

(Guilford, 1963 pp. 580-581)

in all but one instance. The correlation coefficient obtained between figural flexibility and figural elaboration of  $r=.19$  was not statistically significant. Although significant relationships were obtained among the figural test items, these relationships were lower than those obtained for verbal creativity.

The coefficient of correlation between figural elaboration and figural creativity of  $r=.91$  indicates a strong relationship between these two items. This suggests that figural elaboration makes a statistically significant contribution to the total figural creativity score and that persons who produce more complex ideas from a basic idea by adding to the original product on the figural tests tend to achieve higher total scores than the individuals who do not.

The moderately significant correlation of  $r=.57$  between figural fluency and figural creativity does not support the theory that fluency scores alone can be used to evaluate creativity.

The verbal test items and the figural test items were significantly but not highly related in all but one instance. A non-significant relationship of  $r=.24$  was found between figural fluency and verbal flexibility. The absence of a strong relationship between the verbal test items and the figural test items suggest that they measure different aspects of creativity.

Verbal creativity correlated only moderately with figural creativity at  $r=.42$ . This further indicates that these tests

measure separate aspects of creativity. In addition, the data support Torrance's (95) suggestion that both tests are needed to comprehensively evaluate creativity.

The motor creativity test items were significantly related to all verbal sub-test items and to verbal creativity. The coefficients obtained for the motor creativity sub-tests and the verbal creativity sub-tests ranged from  $r=.34$  to  $.62$ . The coefficients obtained between the verbal creativity sub-test items and motor creativity ranged from  $r=.45$  to  $.66$ . A moderate coefficient of  $r=.54$  was obtained between verbal creativity and motor creativity.

Motor creativity test items were significantly related to figural originality, figural elaboration and figural creativity. However, there were no significant relationships between the motor creativity test items and figural fluency and figural flexibility. These correlation coefficients ranged from  $r=-.04$  for figural flexibility and motor fluency to  $.25$  for figural flexibility and motor originality.

Motor creativity in this study did not appear to measure a different aspect of creativity as purported by Wyrick (97) and Philipp (91). Therefore, the null hypothesis that the correlation in the population among verbal creativity, figural creativity and motor creativity is equal to zero is rejected in all instances except those specifically related to the aspects of motor creativity, and figural fluency and figural flexibility.

A correlation coefficient of  $r=.71$  was obtained between motor fluency and motor originality. This correlation was not

high enough to support the theory that persons who produce a great number of responses also produce many unusual ones.

Motor creativity correlated .87 with motor fluency and .92 with motor originality. The latter coefficient supports Wyrick's (97) suggestion that the motor originality score is a good overall predictor of motor creativity.

In summary, high intercorrelations were obtained between verbal creativity scores while the intercorrelations between the figural creativity scores were lower. The correlations between the verbal test items and the figural test items were statistically significant in all but one instance. However, the significant relationships were not high enough to support the use of one test to comprehensively evaluate creativity. These data reveal that these tests evaluate similar but not identical aspects of creativity. Motor creativity appeared to measure similar but not identical traits of creativity as measured by The Torrance Test of Creative Thinking. In addition, the motor creativity test items were moderately related. A high relationship between motor originality and motor creativity was obtained.

#### Correlations for girls

Table 2 depicts the resulting correlation coefficients for girls on all variables. High intercorrelations were obtained between all aspects of verbal creativity with the highest relationship occurring between verbal fluency and verbal creativity ( $r=.94$ ).

Negative non-significant relationships were shown between figural fluency and all aspects of verbal creativity. A similar



**TABLE 2**  
**INTERCORRELATIONS OF ALL VARIABLES**  
**GIRLS (N = 24)**

VARIABLES	1	2	3	4	5	6
1. Verbal Fluency		.89**	.82**	.94**	-.06	-.06
2. Verbal Flexibility			.80**	.92**	-.08	.06
3. Verbal Originality				.91**	-.11	-.03
4. Verbal Creativity					-.09	.03
5. Figural Fluency						.69**
6. Figural Flexibility						
7. Figural Originality						
8. Figural Elaboration						
9. Figural Creativity						
10. Motor Fluency						
11. Motor Originality						
12. Motor Creativity						
Mean	49.29	50.33	49.08	47.91	54.08	50.25
Standard Deviation	11.12	11.05	11.19	13.43	7.90	7.56

\*  $r > .40$      $p < .05^a$

\*\*  $r > .52$      $p < .01^a$

<sup>a</sup>Values From Wallace and Snedecor's Tables

(Guilford, 1963 pp. 580-581)

TABLE 2 (continued)

VARIABLES	7	8	9	10	11	12
1. Verbal Fluency	.19	.44*	.37	.46*	.25	.41*
2. Verbal Flexibility	.19	.36	.31	.53**	.30	.47*
3. Verbal Originality	.22	.37	.32	.65**	.46*	.61**
4. Verbal Creativity	.22	.38	.34	.54**	.35	.50*
5. Figural Fluency	.42*	.18	.45*	-.41*	-.26	-.38
6. Figural Flexibility	.33	.09	.22	-.23	-.20	-.22
7. Figural Originality		.67**	.85**	.32	.25	.31
8. Figural Elaboration			.93**	.38	.30	.37
9. Figural Creativity				.28	.23	.27
10. Motor Fluency					.86**	.99**
11. Motor Originality						.93**
12. Motor Creativity						
Mean	50.92	48.08	52.88	47.75	45.17	48.46
Standard Deviation	7.48	7.83	6.91	11.75	7.91	8.79

\*  $r > .40$      $p < .05^a$

\*\*  $r > .52$      $p < .01^a$

<sup>a</sup>Values From Wallace and Snedecor's Tables

(Guilford, 1963 pp 580-581)

situation appears to have occurred between figural flexibility and the verbal creativity aspects of verbal fluency and verbal originality. The only significant relationship between the verbal creativity test items and the figural creativity test items occurred between verbal fluency and figural elaboration where a moderate correlation of ( $r=.44$ ) was obtained. These data suggest that girls who did well on the figural creativity tests did not do well on verbal creativity tests. Correlations between figural creativity sub-tests and figural creativity ranged from  $r=.09$  to  $.93$ . Figural flexibility was significantly related to figural fluency but failed to demonstrate a significant relationship with the other aspects of figural creativity. The high correlation between figural elaboration and figural creativity suggests that figural elaboration makes a statistically significant contribution to the total figural creativity score.

Motor fluency was only moderately, although significantly, related to all aspects of verbal creativity and was significantly related to only one aspect of figural creativity, figural fluency. It would appear that the girls in this study who performed well on the figural creativity test did not do well on the motor fluency items.

Motor originality seems to be a discrete aspect of creativity. Motor originality scores failed to correlate significantly with verbal and figural creativity test items in all but one instance. A moderately significant correlation coefficient of  $r=.46$  was obtained between motor and verbal originality.

Motor creativity correlated significantly with all aspects of verbal creativity but no significant correlations were obtained between motor creativity and the aspects of figural creativity.

The extremely high coefficient of correlation ( $r=.99$ ) between motor fluency and motor creativity supports the use of fluency scores alone for the evaluation of motor creativity.

In summary, it appears that among the girls included as subjects in this study verbal creativity and motor creativity measure similar but not identical aspects of creativity. But, figural creativity is another distinct aspect of creativity. The high correlation between motor fluency and motor creativity suggests that fluency scores alone might be used to assess motor creativity for girls.

#### Correlations for boys

Table 3 depicts the resulting correlation coefficients obtained for boys on all variables. Statistically significant correlations were obtained between all of the aspects of verbal creativity with the highest relationship occurring between verbal fluency and verbal creativity.

All aspects of verbal creativity and all aspects of figural creativity were significantly related except for figural elaboration which demonstrated only one significant relationship with the aspects of verbal creativity. Boys who did well on figural elaboration did not do well on verbal fluency, verbal flexibility and verbal creativity.

**TABLE 3**  
**INTERCORRELATIONS OF ALL VARIABLES**

Boys (N = 26)

VARIABLES	1	2	3	4	5	6
1. Verbal Fluency		.83**	.80**	.94**	.70**	.72**
2. Verbal Flexibility			.87**	.92**	.60**	.57**
3. Verbal Originality				.91**	.67**	.59**
4. Verbal Creativity					.66**	.63**
5. Figural Fluency						.88**
6. Figural Flexibility						
7. Figural Originality						
8. Figural Elaboration						
9. Figural Creativity						
10. Motor Fluency						
11. Motor Originality						
12. Motor Creativity						
Mean	50.31	50.35	50.12	48.77	48.69	47.88
Standard Deviation	9.87	7.62	10.78	11.93	10.70	11.29

\*  $r > .39$      $p < .05^a$

\*\*  $r > .50$      $p < .01^a$

<sup>a</sup>Values From Wallace and Snedecor's Tables

(Guilford, 1963 pp. 580-581)

TABLE 3 (continued)

VARIABLES	7	8	9	10	11	12
1. Verbal Fluency	.69**	.26	.50**	.38	.43*	.48**
2. Verbal Flexibility	.59**	.35	.48*	.55**	.55**	.59**
3. Verbal Originality	.65**	.48*	.60**	.58**	.61**	.71**
4. Verbal Creativity	.65**	.32	.50**	.52**	.50**	.60**
5. Figural Fluency	.82**	.46*	.69**	.26	.46*	.50**
6. Figural Flexibility	.86**	.36	.67**	.31	.47*	.51**
7. Figural Originality		.62**	.87**	.39*	.74**	.74**
8. Figural Elaboration			.92**	.22	.64**	.62**
9. Figural Creativity				.31	.74**	.73**
10. Motor Fluency					.65**	.78**
11. Motor Originality						.94**
12. Motor Creativity						
Mean	49.62	52.50	54.35	50.27	49.58	52.12
Standard Deviation	10.84	11.71	11.46	11.57	12.30	10.04

\*  $r > .39$   $p < .05^a$

\*\*  $r > .50$   $p < .01^a$

<sup>a</sup>Values From Wallace and Snedecor's Tables

(Guilford, 1963 pp. 580-581)

Motor fluency was significantly related to all aspects of verbal creativity except verbal fluency. But, the only significant relationship between motor fluency and the aspects of figural creativity was revealed with figural originality.

Motor originality correlated significantly with all aspects of verbal and figural creativity except verbal fluency. In addition, significant relationships were revealed between motor creativity and all aspects of verbal and figural creativity. The significant and high correlation between motor originality and motor creativity suggests that the motor originality score could be used to assess motor creativity.

In summary, significant intercorrelations were obtained for boys between all aspects of verbal creativity. Significant relationships were obtained between all aspects of verbal creativity and all aspects of figural creativity except those involving the relationship between figural elaboration and verbal fluency, verbal flexibility and verbal creativity. Generally, motor fluency was significantly related to the aspects of verbal creativity but not to the aspects of figural creativity. Motor originality and motor creativity were significantly related to all aspects of verbal creativity and all aspects of figural creativity.

#### Summary

The aspects of verbal creativity, figural creativity and motor creativity were significantly related for the total population and for the boys alone. For the girls' group,

significant relationships were revealed between the aspects of verbal creativity and the aspects of motor creativity. These data suggest that the creative performance of girls is not as extensive as the performance of the total population and the boys' group.

Motor originality was significantly related to the aspects of verbal creativity and figural creativity for the boys' group. The extremely high correlation between motor originality and motor creativity suggests that motor originality scores could be used to assess motor creativity for boys. On the other hand, the high significant relationships between motor fluency and motor creativity for the total population and the girls' group suggest that motor fluency could be used to assess motor creativity for the total population and the girls' group.

#### STEPWISE MULTIPLE CORRELATION AND REGRESSION ANALYSIS

Stepwise multiple correlation and regression analyses were computed and evaluated for predictive value using motor fluency, motor originality, and motor creativity as dependent variables and considering each of the other variables as independent variables. These analyses were evaluated in regard to 1) the total population, 2) the girls' group, and 3) the boys' group.

##### The Total Population

Nine multiple regression equations were computed from the data of the total population using motor fluency as the dependent variable. The significance of the multiple correlation



coefficients was determined by the use of "Table D--Coefficients of Correlation and t Ratios," reproduced in Guilford (15, pp. 580-581), from Wallace and Snedecor's Correlation and Machine Calculation. The results of the stepwise multiple correlation and regression analysis for the total population using motor fluency as the dependent variable are found in Table 4.

TABLE 4  
STEPWISE MULTIPLE CORRELATION AND REGRESSION ANALYSIS  
WITH MOTOR FLUENCY AS THE DEPENDENT  
VARIABLE: TOTAL POPULATION  
(N = 50)

STEP	VARIABLE ENTERING EQUATION	MULTIPLE $r^a$	COEFFICIENT OF DETERMINATION	F RATIO <sup>a</sup>
1	Verbal Originality	.615	.378	29.21
2	Figural Fluency	.663	.440	18.44
3	Figural Originality	.725	.526	16.95
4	Verbal Flexibility	.725	.526	12.48
5	Verbal Fluency	.746	.557	11.07
6	Verbal Creativity	.747	.558	9.02
7	Figural Creativity	.756	.572	8.03
8	Figural Elaboration	.756	.572	6.86
9	Figural Flexibility	.757	.573	5.94

a = all values significant at the .01 level

The single independent variable entered in step 1 of Table 4 had the greatest effect on motor fluency. It was considered the best single variable for estimating motor fluency.

Verbal originality had the most effect on motor fluency with a significant  $r$  of .615. The coefficient of determination revealed that 37.8 per cent of the variance of motor fluency can be predicted by verbal originality. Each additional variable, when combined with the preceding ones showed a significant relationship. However, the inclusion of all nine variables only accounted for 57.3 per cent of the total variance of motor fluency. This suggests that a combination of the nine independent variables cannot adequately predict motor fluency despite the significant relationships.

The  $F$  ratio presented in Table 4 determines whether the multiple  $r$ , with more independent variables included, is significantly greater than the  $r$  with a smaller number of variables. These data indicate that the addition of each variable significantly improves the multiple  $r$  although the final multiple  $r$  was not high enough to warrant the use of a combination of tests for predictive purposes.

Table 5 shows the results of the stepwise correlation and regression analysis for the total population using motor originality as the dependent variable.

Verbal originality was the best single variable for estimating motor originality. It accounted for 28.8 per cent of the total motor originality variance and significantly correlated with motor originality at .54. The addition of figural fluency did not increase the amount of variance accounted for nor did it numerically increase the multiple  $r$ . But, the  $F$

TABLE 5  
 STEPWISE MULTIPLE CORRELATION AND REGRESSION ANALYSIS  
 WITH MOTOR ORIGINALITY AS THE DEPENDENT  
 VARIABLE: TOTAL POPULATION  
 (N = 50)

STEP	VARIABLE ENTERING EQUATION	MULTIPLE $r^a$	COEFFICIENT OF DETERMINATION	F RATIO <sup>a</sup>
1	Verbal Originality	.537	.288	19.51
2	Figural Fluency	.537	.288	9.55
3	Verbal Fluency	.559	.313	6.98
4	Figural Flexibility	.726	.527	12.54
5	Figural Originality	.758	.575	11.92
6	Figural Elaboration	.761	.579	9.87
7	Verbal Flexibility	.762	.581	8.33
8	Verbal Creativity	.764	.584	7.71
9	Figural Creativity	.765	.585	6.26

a = all values significant at the .01 level

test of significance of differences between multiple  $r$ 's revealed that its inclusion was significant at the .01 level.

The addition of all nine variables accounted for 58.5 per cent of the total variance of motor originality and significantly correlated at .77 with it. The variance accounted for was too small to accurately predict motor originality from these variables. However, these data revealed that motor originality was similar to but not identical to the other selected aspects of creativity.

The results of the stepwise multiple correlation and regression analysis for the total population using motor creativity as the dependent variable are found in Table 6.

TABLE 6  
STEPWISE MULTIPLE CORRELATION AND REGRESSION ANALYSIS  
WITH MOTOR CREATIVITY AS THE DEPENDENT  
VARIABLE: TOTAL POPULATION  
(N = 50)

STEP	VARIABLE ENTERING EQUATION	MULTIPLE $r$	COEFFICIENT OF DETERMINATION	F RATIO
1	Verbal Originality	.114	.013	.627
2	Figural Fluency	.666*	.444	18.77*
3	Figural Originality	.804*	.646	28.08*
4	Verbal Fluency	.824*	.679	23.79*
5	Verbal Flexibility	.829*	.687	18.74*
6	Figural Creativity	.830*	.689	15.84*
7	Figural Elaboration	.831*	.691	13.35*
8	Figural Flexibility	.831*	.691	11.41*
9	Verbal Creativity	.832*	.692	10.53*

\* = significant at the .01 level

Verbal originality was the best single variable for estimating motor creativity. It explains only 1 per cent of the total variance of motor creativity and did not correlate significantly with motor creativity. The addition of a second variable, figural fluency, significantly increased the multiple  $r$  to .666 and the

two variables combined accounted for 44.4 per cent of the total variance of motor creativity. In addition, the F ratio of 18.77 indicated that the inclusion of verbal originality significantly improved the multiple r.

When all variables were included, the total variance of motor creativity accounted for was 69.2 per cent with a multiple r of .832 and a significant F ratio of 10.53. The coefficient of alienation ( $K=1-R^2$ ) is .308. This indicates that 30.8 per cent of the total variance of motor creativity was not accounted for by the other creativity variables. Studies have purported that creativity scores are affected by many experimentally uncontrollable human factors, therefore these data suggest that a combination of verbal creativity and figural creativity measures can be carefully used for predictive purposes when adequate tools designed to assess motor creativity are not readily available.

### Girls

Nine multiple regression equations were computed from the data of the girls alone using motor fluency as the dependent variable. The results of the stepwise multiple correlation and regression analysis for girls using motor fluency as the dependent variable may be found in Table 7.

The single independent variable entered in step 1 of Table 7 had the greatest effect on motor fluency. It was considered the best single variable for estimating motor fluency.

Verbal originality had the most effect on motor fluency with a significant r of .647. The coefficient of

TABLE 7  
 STEPWISE MULTIPLE CORRELATION AND REGRESSION ANALYSIS  
 WITH MOTOR FLUENCY AS THE DEPENDENT  
 VARIABLE: GIRLS  
 (N = 24)

STEP	VARIABLE ENTERING EQUATION	MULTIPLE $r^a$	COEFFICIENT OF DETERMINATION	F RATIO <sup>a</sup>
1	Verbal Originality	.647	.419	15.84
2	Figural Fluency	.730	.533	12.01
3	Figural Originality	.821	.647	13.76
4	Verbal Flexibility	.826	.681	10.24
5	Verbal Fluency	.835	.697	8.30
6	Verbal Creativity	.837	.701	6.62
7	Figural Creativity	.845	.714	5.72
8	Figural Elaboration	.845	.714	4.69
9	Figural Flexibility	.852	.726	4.13

a = all values significant at the .01 level

determination revealed that 41.9 per cent of the variance of motor fluency can be predicted by verbal originality. The addition of the next two variables, figural fluency and figural originality, increased the variance accounted for to 67.4 per cent. Each additional variable, when combined with the preceding ones showed a significant relationship. The inclusion of all nine variables accounted for 72.6 per cent of the total variance of motor fluency. These findings suggest that a combination of the selected independent variables can be utilized to predict motor fluency for girls with some degree of accuracy.

The F ratio presented in Table 7 determines whether the multiple r, with more independent variables included, is significantly greater than the r with a smaller number of variables. These data reveal a significant F ratio with the addition of each variable.

Table 8 shows the results of the stepwise multiple correlation and regression analysis for girls using motor originality as the dependent variable.

TABLE 8  
STEPWISE MULTIPLE CORRELATION AND REGRESSION ANALYSIS  
WITH MOTOR ORIGINALITY AS THE DEPENDENT  
VARIABLE: GIRLS  
(N = 24)

STEP	VARIABLE ENTERING EQUATION	MULTIPLE r	COEFFICIENT OF DETERMINATION	F RATIO
1	Verbal Originality	.464*	.215	6.02*
2	Figural Fluency	.508*	.258	3.66*
3	Figural Flexibility	.511	.261	2.36
4	Verbal Fluency	.557	.310	2.13
5	Figural Creativity	.617	.381	2.22
6	Figural Elaboration	.631	.398	1.88
7	Figural Originality	.635	.403	1.55
8	Verbal Flexibility	.639	.408	1.30
9	Verbal Creativity	.640	.410	1.08

\* = values significant at the .05 level

Verbal originality was the best single variable for estimating motor originality for girls. It accounted for 21.5 per cent of the motor originality variance and was significantly correlated with it at the .05 level. The addition of figural fluency significantly increased the multiple  $r$  and accounted for 25.8 per cent of the motor originality variance. The addition of the remaining variables reduced the multiple correlation coefficients below the .05 level of significance and accounted for only 41 per cent of the total variance for motor originality.

The obtained  $F$  ratios of 6.02 and 3.66 indicate that the first and second independent variables made significant increases in the proportion of the variance of motor originality that can be accounted for by these variables. With the addition of each of the remaining variables, the  $F$  ratio dropped below the level necessary for significance and the strength of the multiple  $r$  was gradually reduced.

The second multiple regression equation consisting of verbal originality plus figural fluency, computed from the data for girls, was found to have the highest predictive value for motor originality. However, the amount of variance accounted for was not high enough to accurately predict motor originality from this combination of variables.

The results of the stepwise correlation and regression analysis for the girls using motor creativity as the dependent variable are found in Table 9.

Verbal originality was the best single variable for estimating motor creativity for girls. It explained 37.3 per



cent of the total variance of motor creativity and correlated significantly at the .01 level with motor creativity. The multiple  $r$  remained significant at the .01 level upon the addition of the second variable. When figural originality was added, however, the multiple  $r$  is only significant at the .05 level. But, the addition of the fourth variable brings the level of significance back to the .01 level. When the seventh independent variable, figural elaboration, was added the level of significance returned to the .05 level of significance.

TABLE 9  
STEPWISE MULTIPLE CORRELATION AND REGRESSION ANALYSIS  
WITH MOTOR CREATIVITY AS THE DEPENDENT  
VARIABLE: GIRLS  
(N = 24)

STEP	VARIABLE ENTERING EQUATION	MULTIPLE $r$	COEFFICIENT OF DETERMINATION	F RATIO
1	Verbal Originality	.611**	.373	13.12**
2	Verbal Flexibility	.612**	.375	6.29**
3	Figural Originality	.638*	.407	4.57*
4	Figural Fluency	.772**	.596	6.99**
5	Verbal Creativity	.793**	.629	6.11**
6	Verbal Fluency	.795**	.632	4.88**
7	Figural Elaboration	.797**	.635	3.97*
8	Figural Creativity	.798*	.637	3.28*
9	Figural Flexibility	.798*	.637	2.73*

\* = significant at the .05 level  
\*\* = significant at the .01 level

The significant  $F$  ratios indicated that the independent variables have made significant increases in the proportion of variance of motor creativity that can be accounted for by those variables.

In summary, it appears that motor fluency can be predicted by utilizing the variables in this study more efficiently than motor originality and motor creativity for girls. High scores on a combination of figural creativity and verbal creativity measures are indicative of high performance on the motor fluency test for girls within this sample.

### Boys

Nine multiple regression equations were computed from the boys' group using motor fluency as the dependent variable. The results of the stepwise multiple correlation and regression analysis for boys using motor fluency as the dependent variable may be found in Table 10.

Verbal fluency had the most effect on motor fluency for boys with a multiple  $r$  of .382, significant at the .05 level. The coefficient of determination revealed that 14.9 per cent of the variance of motor fluency could be predicted by verbal fluency. The  $F$  ratio in the initial equation was not significant. The addition of verbal originality caused significant gains in the multiple  $r$  and the  $F$  ratio to the .01 level, accounting for 35.9 per cent of the variance of motor fluency for boys.

The consecutive addition of figural fluency, verbal flexibility and figural elaboration reduced the resulting multiple  $r$ 's to the .05 level. The corresponding  $F$  ratios indicated that

TABLE 10  
 STEPWISE MULTIPLE CORRELATION AND REGRESSION ANALYSIS  
 WITH MOTOR FLUENCY AS THE DEPENDENT  
 VARIABLE: BOYS  
 (N = 26)

STEP	VARIABLE ENTERING EQUATION	MULTIPLE r	COEFFICIENT OF DETERMINATION	F RATIO
1	Verbal Fluency	.382*	.146	4.09
2	Verbal Originality	.599*	.359	6.43**
3	Figural Fluency	.614*	.377	9.73**
4	Verbal Flexibility	.635*	.403	3.55*
5	Figural Elaboration	.638*	.407	2.75*
6	Verbal Creativity	.645	.416	2.25
7	Figural Creativity	.714	.510	2.68*
8	Figural Originality	.715	.511	2.23
9	Figural Flexibility	.715	.511	1.86

\* = significant at the .05 level

\*\* = significant at the .01 level

the inclusion of these variables significantly improved the multiple r. Each additional variable, when combined with the preceding ones, failed to show a significant relationship. But, with the addition of figural creativity the F ratio of 2.68 revealed that the multiple r was significantly strengthened at the .05 level.

The addition of all nine variables accounted for only 51.1 per cent of the total variance of motor fluency for boys, which is not adequate for predictive purposes.

Table 11 shows the results of the stepwise multiple correlation and regression analysis for boys using motor originality as the dependent variable.

TABLE 11  
STEPWISE MULTIPLE CORRELATION AND REGRESSION ANALYSIS  
WITH MOTOR ORIGINALITY AS THE DEPENDENT  
VARIABLE: BOYS  
(N = 26)

STEP	VARIABLE ENTERING EQUATION	MULTIPLE $r^a$	COEFFICIENT OF DETERMINATION	F RATIO <sup>a</sup>
1	Figural Originality	.742	.551	29.45
2	Verbal Flexibility	.754	.569	15.18
3	Verbal Originality	.762	.581	10.15
4	Figural Flexibility	.841	.707	12.69
5	Figural Fluency	.853	.727	10.70
6	Figural Elaboration	.857	.734	8.83
7	Figural Creativity	.859	.738	7.26
8	Verbal Fluency	.891	.794	8.15
9	Verbal Creativity	.894	.799	7.04

a = all values significant at the .01 level

Figural originality was the best single variable for estimating motor originality for boys. It explained 55 per cent of the variance of motor originality. The corresponding F ratio of 29.45 was significant at the .01 level. Each additional variable, when combined with the preceding ones, showed a strong significant relationship. Also, the addition of each variable,

when combined with the preceding ones significantly strengthened the multiple  $r$  in each instance.

The addition of two aspects of verbal creativity, verbal flexibility and verbal originality, and all aspects of figural creativity accounted for 73.8 per cent of the variance of motor originality. Therefore, scores from the figural creativity battery may be used appropriately in the regression equation along with verbal flexibility and verbal originality to predict motor originality. The precision of the prediction may be enhanced to include 79.9 per cent of the variance of motor originality for boys by administering The Torrance Tests of Creative Thinking, Verbal Form A and Figural Form A, and appropriately utilizing these scores in a regression equation which includes all nine variables.

Motor originality for boys appears to be more related to the variables of this study than motor originality for the total population and the girls' group.

The results of the stepwise multiple correlation and regression analysis for boys, using motor creativity as the dependent variable, are found in Table 12.

Motor creativity appears to be significantly related to a combination of verbal creativity and figural creativity measures.

Verbal fluency had the most effect on motor creativity with a significant multiple  $r$  of .489. The coefficient of determination revealed that 23.9 per cent of the variance of motor creativity could be predicted by verbal fluency. Each additional variable,

TABLE 12  
 STEPWISE MULTIPLE CORRELATION AND REGRESSION ANALYSIS  
 WITH MOTOR CREATIVITY AS THE DEPENDENT  
 VARIABLE: BOYS  
 (N = 26)

STEP	VARIABLE ENTERING EQUATION	MULTIPLE $r$	COEFFICIENT OF DETERMINATION	F RATIO
1	Verbal Fluency	.489*	.239	7.54*
2	Verbal Originality	.722**	.521	12.51**
3	Figural Creativity	.821**	.674	15.17**
4	Figural Elaboration	.837**	.701	12.45**
5	Figural Fluency	.869**	.789	11.83**
6	Figural Originality	.888**	.789	11.83**
7	Figural Flexibility	.891**	.794	9.90**
8	Verbal Creativity	.895**	.801	8.61**
9	Verbal Flexibility	.897**	.805	7.29**

\* = value significant at the .05 level  
 \*\* = values significant at the .01 level

when combined with the preceding ones, showed a strong significant relationship at the .01 level. The F ratio for the first equation, 7.54, is significant at the .05 level. The addition of the second variable, verbal originality, increased the significance of the F ratio to the .01 level.

The coefficient of determination for the ninth equation revealed that 80.5 per cent of the variance of motor creativity can be predicted by The Torrance Tests of Creative Thinking, Verbal Form A and Figural Form A.

Motor creativity for boys appears to be more related to the variables of this study than motor creativity for the total population and the girls' group.

#### MULTIVARIATE ANALYSIS OF VARIANCE

Multivariate Analysis of Variance was used to test the null hypothesis that the difference between sex and verbal creativity, figural creativity and motor creativity is equal to zero. This analysis provided additional data concerning the significance of differences between the creativity traits and the interaction of sex and creativity. However, these areas were not a part of the hypotheses tested in this study. Therefore, the findings discussed will be limited to the significance of difference between boys and girls on verbal creativity, figural creativity and motor creativity.

In the statistical analysis the probability, on the null hypothesis of the observed mean differences between sexes for all variables, is simultaneously obtained by an exact multivariate test of significance. Univariate tests could be performed on each variable separately but a single probability statement applicable to all variables jointly cannot, in general, be obtained from separate univariate analyses. All variables have been obtained from the same subject; therefore, they are correlated in a manner that makes them statistically dependent. As a result, separate analyses would not be statistically independent. And, no exact probability that at least one of them will exceed some critical level on the null hypothesis can

be calculated. On the other hand, multivariate tests are based on sample statistics which take into account the correlations between the variables and have known exact sampling distributions from which the required probabilities can be obtained (4).

Table 13 shows the multivariate and univariate tests of significance of sex on verbal creativity, figural creativity and motor creativity using Wilks' lambda criterion and canonical correlations.

TABLE 13

MULTIVARIATE AND UNIVARIATE ANALYSES OF SEX ON THE  
VERBAL CREATIVITY, FIGURAL CREATIVITY AND  
MOTOR CREATIVITY TRAITS

a. <u>Summary of Multivariate ANOVA</u>						
Source	dfn	dfe	F	P Less Than	R	
Sex	5	145	1.50	.193	.23	
b. <u>Summary of Univariate F's</u>						
Source	df	Mean SQ	F	P Less Than		
Fluency	1/144	14.325	0.129	0.720		
Flexibility	1/144	20.821	0.341	0.560		
Originality	1/144	71.342	0.675	0.413		
Elaboration	1/144	81.148	2.414	0.122		
Total	1/144	148.810	1.308	0.255		

As shown in Table 13, section a, a multivariate F of 1.50 was obtained for the significance of difference between sex and the aspects of verbal creativity, figural creativity, and motor



creativity. The F value obtained was smaller than the critical value of significance accepted for this study.

The canonical correlation coefficient is the product-moment correlation coefficient of the maximally linear relationship of sex with the aspects of verbal creativity, figural creativity and motor creativity. The low canonical correlation coefficient of .23 further indicated that there was little relationship between sex and test performance.

Analysis of the univariate F's in section b of Table 13 for sex and performance on the aspects of verbal creativity, figural creativity and motor creativity revealed that none of the F values was larger than the critical values of significance accepted for this study.

Bock (4) contends that conventional univariate tests cannot safely be applied to a difference picked out of multivariate data because they are too large. He advocates the use of the step-down F test to pick out differences from multivariate data. The univariate F's in this study were all smaller than the critical value. Therefore, the use of step-down statistics would not be appropriate for this study.

The null hypothesis of no difference between sex and the aspects of verbal creativity, figural creativity and motor creativity was held tenable because of the non-significant F obtained from the multivariate analysis of these factors.

#### SUMMARY

Intercorrelation matrices were computed to obtain relationships between all pairings of variables for the total population,

and for the boys and girls separately. When the total population was divided according to sex, differences in the relationships between pairings of variables for boys and girls were noted. The coefficients of correlation between pairings of variables for the total population were affected by these differences. The aspects of verbal creativity, figural creativity and motor creativity were significantly related for the total population and for the boys alone. For the girls' group, significant relationships were revealed between the aspects of verbal creativity and the aspects of motor creativity. These data suggest that the creative performance of girls, when evaluated separately, is not as extensive as the creative performance of the boys and the heterosexually grouped total population. The extremely high correlation between motor originality and motor creativity suggests that motor originality scores may be used to assess motor creativity for boys. On the other hand, the high significant relationship between motor fluency and motor creativity for the total population and the girls' group suggests that motor fluency may be used to assess motor creativity for girls who meet the requirements of subjects included in this sample.

Stepwise multiple correlation and regression analyses were done with the aspects of motor creativity as dependent variables for the total population, and for boys and girls separately. These data revealed that motor creativity could be predicted by the selected aspects of verbal creativity and figural creativity for the boys' group and for the total population.

However, the total variance of motor creativity accounted for by the aspects of verbal creativity and figural creativity was higher for the boys' group. It would appear that the stepwise multiple correlation and regression analysis for the total population was affected by the stepwise multiple correlation and regression analysis for the boys' group.

In addition, these data revealed that motor fluency could be predicted by the selected aspects of verbal creativity and figural creativity for the girls' group. On the other hand, motor originality could be predicted by the selected aspects of verbal creativity and figural creativity for the boys' group.

It appears that motor originality and motor creativity for the boys' group are more related to the variables of this study than motor originality and motor creativity for the girls' group and the total population which includes both sexes.

A multivariate analysis of variance test between means was used to evaluate the significance of difference between boys and girls on aspects of verbal creativity, figural creativity and motor creativity. This multivariate analysis of variance revealed that there was not a significant difference between boys and girls on the combined aspects of verbal creativity, figural creativity and motor creativity.

Finally, the data revealed that boys and girls were not significantly different in regard to each groups' average performance on the combined aspects of verbal creativity, figural creativity and motor creativity. When the degrees of relationships

among the aspects of verbal creativity, figural creativity and motor creativity were examined, differences in relationships between pairings of variables for boys and girls were evident.

## CHAPTER V

## SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

## SUMMARY

Regardless of what is ultimately decided about the educational implications of creativity, it is vitally important that we develop an accurate workable theory regarding creativity. Recent researchers have contributed much toward the understanding of many aspects of creativity. Attempts to define or to acquire a more comprehensive understanding of creativity have resulted in the study of the creative process, creative product, the measurement of creativity and the creative personality.

Very little research has been done on the relationship between creativity and motor performance. However, several writers have given attention to the role of creativity in the learning of physical skills. Experimentation to date reveals that there is little or no relationship between creative thinking and motor performance as measured by motor ability tests.

Wyrick devised a test designed to differentiate for comparative purposes levels of individuals' abilities to produce motor responses to tasks of a problem solving nature. Presently, this is the only known test of motor creativity available for use. And, it is recommended for research purposes only. Studies have been conducted utilizing the Wyrick Test of Motor Creativity to determine the relationship between motor creativity and other selected factors. These studies revealed that there is little or no relationship between motor creativity and creative thinking.

According to our sociological stratification system, most of the research in the area of creativity utilized subjects who possessed experiential middle-class backgrounds. Very little work has been done in which culturally deprived children were used as subjects. Writers have theorized that the culturally deprived are more creative in the non-verbal areas and are not nearly as non-verbal as is generally thought. In addition, these same writers have indicated that culturally deprived children are more visually creative than their middle-class peers. They assume too that these children are more likely to possess one-track creativity, the ability to relentlessly pursue one line of thought for long periods of time.

The general aim of this investigation was to determine what relationships, if any, exist between verbal creativity, figural creativity and motor creativity of black culturally deprived children. More specifically, the goal of this study was realized by investigating the tenability of the null hypotheses that state that significant relationships do not exist between 1) the correlation coefficient of girls among verbal creativity, figural creativity and motor creativity, 2) the correlation coefficients for boys among verbal creativity, figural creativity and motor creativity, 3) the correlation coefficients for the total population among verbal creativity, figural creativity and motor creativity, 4) the regression coefficients for girls among motor creativity and a combination of other creativity variables, 5) the regression coefficients for boys among motor creativity

and a combination of other creativity variables, and 6) the regression coefficients for the total population among motor creativity and a combination of other creativity variables. Additionally, the goal of this study was realized by investigating the tenability of the null hypothesis that states significant differences between the mean of boys and girls on verbal creativity, figural creativity and motor creativity do not exist.

The subjects for this study were fifty students, aged ten through twelve, enrolled at Newbold Elementary School, Fayetteville, North Carolina. Newbold School is located in a predominately black, urban, culturally deprived-class area in Fayetteville, North Carolina. The majority of the children enrolled in this school are drawn from this area.

Three instruments were selected to gather the necessary data. Two forms of the Torrance Tests of Creative Thinking, Verbal Form A and Figural Form A, were independently scored by trained persons employed by the Center For Creative Leadership: Creativity Programs, at Greensboro, North Carolina. The Wyrick Test of Motor Creativity was scored by the investigator.

Data were collected on twelve variables. Variables included were; verbal fluency, verbal flexibility, verbal originality, verbal creativity, figural fluency, figural flexibility, figural originality, figural elaboration, figural creativity, motor fluency, motor originality, and motor creativity.

Raw scores were converted to T scores for each battery item. Collected data were analyzed by use of an IBM 2780

transmission terminal connected to an IBM 360 computer. Intercorrelation matrices were computed to obtain relationships between all pairings of variables for the total population, and for boys and girls separately. Stepwise multiple correlation and regression analyses were done with the motor creativity variables as dependent variables and all other variables considered as independent variables for the total population, and for boys and girls separately. The null hypothesis of no difference between the means of the boys' group and the girls' group was tested by MANOVA. The .05 level of significance was chosen to test the null hypotheses.

The correlations between verbal creativity, figural creativity and motor creativity for the total population were significant, but only moderately so. In addition, the correlations between the verbal test items and the figural test items were significant in all but one instance. The motor creativity test items were significantly related to all the verbal creativity test items and all of the figural creativity test items except figural fluency and figural flexibility. These data suggest that verbal creativity, figural creativity and motor creativity measure similar but not identical traits for the total population.

Analysis of the girls' group alone revealed that verbal creativity and motor creativity measured similar but not identical aspects of creativity. But, figural creativity was another distinct aspect of creativity. The high correlation



obtained between motor fluency and motor creativity suggests that fluency scores alone may be used to assess motor creativity for girls.

The coefficient of correlations for the boys' group between verbal creativity, figural creativity and motor creativity were all significant. Significant relationships were obtained between all aspects of verbal creativity and all aspects of figural creativity except those involving the relationship between figural elaboration and verbal fluency, and verbal flexibility and verbal creativity. Generally, motor fluency was significantly related to the aspects of verbal creativity but not to the aspects of figural creativity. Motor originality and motor creativity were significantly related to all aspects of verbal creativity and figural creativity. In addition, the high correlation between motor originality and motor creativity suggests that motor originality scores alone may be used to assess motor creativity for boys.

Stepwise multiple correlation and regression analyses were used to determine if the aspects of motor creativity were related to a combination of the other variables. When the total population was taken as a group, motor creativity appeared to be related to a combination of the other variables while motor fluency and motor originality alone were not. When the population was divided according to sex, differences between the performance of boys and the performance of girls were noted.

It appeared that motor fluency could be predicted by utilizing the variables in this study more efficiently than

motor originality and motor creativity for girls. High scores on a combination of verbal creativity and figural creativity measures were indicative of high performance on motor fluency for girls within this sample. On the other hand, both motor originality and motor creativity for boys appeared to be related to a combination of the other variables while motor fluency did not. It appeared that both motor originality and motor creativity could be predicted by the appropriate utilization of a combination of verbal creativity and figural creativity measures for boys.

A multivariate analysis of variance test between means was used to evaluate the significance of differences between boys and girls on aspects of verbal creativity, figural creativity and motor creativity.

The multivariate F obtained from this analysis failed to attain the standard for significance of difference from zero indicating that there was not a significant difference between boys and girls on the combined aspects of verbal creativity, figural creativity and motor creativity.

#### CONCLUSIONS

Within the limitations of this study and with specific reference to ten, eleven, and twelve year old black culturally deprived boys and girls, the following conclusions seem justified:

1. There is a significant positive correlation between verbal creativity and figural creativity within the

- total population and within the boys' group, but not within the girls' group.
2. There is a significant positive correlation between verbal creativity and motor creativity within the total population and within the boys' and girls' group, separately.
  3. There is a significant positive correlation between figural creativity and motor creativity within the total population and within the boys' group, but not within the girls' group.
  4. The verbal creativity and figural creativity batteries assess similar qualities to a moderate degree for the total population and for the boys' group, but not for the girls' group.
  5. The verbal creativity and motor creativity batteries assess similar qualities to a moderate degree for the total population and for the boys' group, but are less powerful for the girls' group.
  6. The figural creativity and motor creativity batteries assess similar qualities to a moderate degree for the total population excluding figural fluency and figural flexibility.
  7. The figural creativity and motor creativity batteries do not assess similar qualities for girls. The only significant correlation between these batteries is between figural fluency and motor fluency and it is inverse.

8. The figural creativity and motor creativity batteries assess similar qualities to a moderate degree for boys when motor fluency is excluded.
9. The variables measured by the verbal creativity and figural creativity test batteries can be used to predict motor fluency for girls.
10. The variables measured by the verbal creativity and figural creativity test batteries can be used to predict motor originality for boys.
11. The variables measured by the verbal creativity and figural creativity test batteries can be used to predict motor creativity for the total population and for the boys' group.
12. Motor creativity for boys is more related to the variables of this study than motor creativity for the total population and for the girls' group.
13. There are no significant differences between boys and girls with reference to the aspects of verbal creativity, figural creativity and motor creativity as measured in this study.

#### RECOMMENDATIONS FOR FURTHER STUDY

The following recommendations are made for further research in the areas in this study:

1. A comprehensive study of creativity as it is related to black culturally deprived children using several age groups.

2. An investigation designed to appraise the motivators used in the Wyrick Test of Motor Creativity using groups from various social strata.
3. The development of a motor creativity test which could be used for classroom purposes.
4. An investigation of the sex related difference in creativity for boys and girls might unearth pertinent information regarding creativity.
5. The construction of a motor creativity test representative of the conditions under which creative behavior most often occurs may enhance our understanding of motor creativity.
6. An investigation of the non-verbal strengths of black culturally deprived children would assist educators in their attempt to provide for the needs of these children.
7. Replication of this study using various socio-economic groups may aid in defining cultural difference. These studies would aid in the evaluation of programs designed to meet the creative needs of each socio-economic group.

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APPENDIX A  
DIRECTIONS FOR MOTOR CREATIVITY TEST



**DIRECTIONS FOR MOTOR CREATIVITY TEST**

1. Parallel Line Test M-1. There are two lines on the floor, line one (1) (point to line 1) and line two (2) (point to line 2). Move in as many different ways as you can from one line to the other. As you move, you must use at least one twisting or turning movement. Do you know what twisting means? Do you know what turning means? Start at line one and move to line two. Remember that you must use at least one twist or turn before you reach line two. When you get to line two (2) come back to line one (1) using a different turning or twisting movement. Keep moving between the lines using a different turning or twisting movement each time until I tell you to stop. Do you understand? Begin.
2. Ball-Wall Test M-2. See this ball? I want you to hit this ball to the wall (point to wall) in as many different ways as you can. It does not matter where the ball hits the wall as long as it touches the wall. You must try to hit the ball a different way each time. As you hit the ball, make sure you don't go over this line (point to restraining line). When I say begin, I want you to start hitting the ball and to keep hitting it until I tell you to stop. Do you understand? Begin.
3. Hoop-Test M-3. Do you know what this is? Yes, (optional) it is a hoop. I want you to pick this hoop off the floor

in as many different ways as you can. You must get the whole hoop off the floor in order for your try to count. After you get it up off the floor, put it back down and pick it up again in a different way. Keep picking it up and putting it down until I tell you to stop. Do you understand? Begin.

**APPENDIX B**

**RAW DATA  
T-SCORES**

## RAW DATA T-SCORES

SUB- JECT	SEX	MOTOR FLU.	MOTOR ORIG.	MOTOR CREAT.	V FLU.	V FLEX.	V ORIG.	V CREAT.
1	F	61	56	59	43	53	51	48
2	F	59	44	54	67	62	68	67
3	F	51	58	55	43	39	40	41
4	F	40	40	42	47	49	48	48
5	F	71	60	66	62	57	62	61
6	F	41	40	43	34	38	37	26
7	F	54	44	52	47	51	49	48
8	F	79	64	72	75	77	79	78
9	F	49	42	48	53	60	54	55
10	F	66	60	63	44	53	52	49
11	F	47	40	47	37	36	40	31
12	F	39	40	42	47	38	39	42
13	F	39	40	42	55	49	61	56
14	F	39	40	42	50	54	49	50
15	F	43	40	44	67	62	48	59
16	F	41	44	45	49	49	58	53
17	F	41	40	43	46	53	49	49
18	F	50	40	48	41	45	39	41
19	F	41	46	45	34	36	32	23
20	F	34	40	39	32	29	31	20
21	F	43	46	46	47	44	53	49
22	F	41	40	43	63	64	49	58

## RAW DATA (continued)

F. FLU.	F. FLEX.	F. ORIG.	F. ELAB.	F. CREAT.
49	52	55	41	49
39	40	41	48	42
46	46	44	42	46
60	60	56	49	56
53	38	71	72	72
46	44	36	39	42
61	60	56	52	58
51	52	52	51	55
41	44	49	48	50
51	48	51	57	58
60	58	66	53	61
50	50	43	44	48
63	48	49	49	54
53	46	49	51	54
61	50	53	48	54
60	52	48	46	52
64	70	54	41	52
41	40	47	39	43
61	50	47	40	47
54	42	48	49	52
56	56	55	42	51
59	58	57	63	66

## RAW DATA (continued)

SUB- JECT	SEX	MOTOR FLU.	MOTOR ORIG.	MOTOR CREAT.	V FLU.	V FLEX.	V ORIG.	V CREAT.
23	F	34	40	39	46	50	42	45
24	F	43	40	44	54	60	48	53
25	M	60	68	63	60	56	53	57
26	M	59	54	57	63	60	63	62
27	M	46	50	49	48	52	39	45
28	M	46	50	49	37	37	39	31
29	M	47	44	48	53	57	63	58
30	M	51	42	49	42	44	43	42
31	M	50	50	51	67	60	62	63
32	M	57	54	56	48	45	48	47
33	M	36	40	40	38	44	38	32
34	M	47	40	44	41	41	43	42
35	M	50	44	49	50	55	51	52
36	M	40	46	45	51	46	39	45
37	M	46	40	45	60	55	53	57
38	M	67	54	61	54	55	51	53
39	M	41	40	43	31	37	36	24
40	M	51	40	49	58	43	46	50
41	M	81	99	92	60	63	75	66
42	M	39	42	42	38	43	36	32
43	M	20	50	53	57	48	54	53
44	M	59	42	53	60	56	60	59
45	M	50	54	52	51	55	48	51

## RAW DATA (continued)

F FLU.	F. FLEX.	F. ORIG.	F. BLAB.	F. CREAT.
66	54	49	49	55
53	48	46	41	47
58	64	61	41	53
60	58	59	55	61
36	34	43	59	54
40	38	45	58	55
64	44	44	54	48
59	56	51	56	59
59	62	61	47	57
44	46	49	44	48
47	42	41	47	48
26	22	29	39	29
41	44	49	53	51
47	44	51	43	48
51	52	47	60	60
50	50	53	51	55
37	38	44	58	54
54	54	52	48	54
66	62	79	96	95
29	26	34	40	39
63	62	66	71	75
54	58	50	44	51
54	60	59	53	59

## RAW DATA (continued)

SUB- JECT	SEX	MOTOR FLU.	MOTOR ORIG.	MOTOR CREAT.	V FLU.	V FLEX.	V ORIG.	V CREAT.
46	M	39	40	42	34	40	33	25
47	M	60	44	55	41	50	51	46
48	M	57	50	55	53	53	53	53
49	M	57	58	58	52	54	62	56
50	M	51	54	53	61	60	64	62



## RAW DATA (continued)

F. FLU.	F. FLEX.	F. ORIG.	F. ELAB.	F. CREAT.
41	44	34	44	43
36	36	36	45	43
53	54	54	48	54
50	50	53	50	55
47	48	46	61	59

**APPENDIX C**

**RAW DATA  
RAW SCORES**

## RAW DATA - RAW SCORES

SUB- JECT	SEX	MOTOR FLU.	MOTOR ORIG.	MOTOR CREAT.	V. FLU.	V. FLEX.	V. ORIG.	V. CREAT.
1	F	25	7	32	37	27	36	100
2	F	23	2	25	85	36	67	188
3	F	18	8	26	37	13	16	66
4	F	10	0	10	44	23	31	98
5	F	32	9	41	74	31	56	151
6	F	11	0	11	18	12	11	41
7	F	20	2	22	44	25	32	101
8	F	37	11	48	101	51	87	238
9	F	16	1	17	57	34	42	133
10	F	28	9	37	39	27	38	104
11	F	16	0	16	25	10	16	51
12	F	9	0	9	45	12	14	71
13	F	9	0	9	61	23	53	137
14	F	9	0	9	51	28	32	111
15	F	12	0	12	84	36	30	150
16	F	11	2	13	49	23	49	121
17	F	11	0	11	43	47	32	122
18	F	17	0	17	32	19	15	66
19	F	11	3	14	18	10	2	30
20	F	6	0	6	14	3	0	17
21	F	12	3	15	45	18	39	102
22	F	11	0	11	77	38	33	148

## RAW DATA (continued)

F. FLU.	F. FLEX.	F. ORIG.	F. ELAB.	F. CREAT.
16	15	38	22	91
9	9	18	45	81
14	12	22	24	72
24	19	39	48	106
19	8	60	128	208
14	11	12	13	50
25	19	40	58	142
18	15	34	54	121
11	11	29	44	95
18	13	33	76	140
24	18	53	62	157
17	14	21	32	84
26	13	29	47	115
19	12	30	54	115
25	14	35	44	118
24	15	28	39	106
27	24	37	19	107
11	9	26	15	61
25	14	26	16	81
20	10	28	48	106
21	17	38	24	90
23	18	41	99	181

## RAW DATA (continued)

SUB- JECT	SEX	MOTOR FLU.	MOTOR ORIG.	MOTOR CREAT.	V. FLU.	V. FLEX.	V. ORIG.	V. CREAT.
23	F	6	0	6	43	24	20	87
24	F	12	0	12	58	34	31	123
25	M	24	13	37	71	30	40	141
26	M	23	6	29	76	34	56	166
27	M	14	4	18	46	26	15	87
28	M	14	4	18	25	11	15	51
29	M	15	2	17	57	31	59	147
30	M	18	1	19	34	18	21	73
31	M	17	4	21	85	34	55	175
32	M	22	6	28	46	19	30	95
33	M	7	0	7	27	18	12	57
34	M	15	0	15	32	15	22	69
35	M	17	2	19	51	29	36	106
36	M	10	3	13	52	20	15	87
37	M	14	0	14	71	29	40	140
38	M	29	6	35	59	29	36	124
39	M	11	0	11	13	11	8	32
40	M	18	0	18	66	17	26	109
41	M	39	35	74	70	37	79	186
42	M	9	1	10	27	22	9	63
43	M	20	4	24	64	17	41	127
44	M	23	1	24	70	30	52	152

## RAW DATA (continued)

F. FLU.	F. FLEX.	F. ORIG.	F. ELAB.	F. CREAT.
28	16	30	50	124
19	13	25	20	77
23	21	47	19	110
24	18	44	70	156
7	6	21	83	117
10	8	24	80	122
11	11	36	25	83
23	17	33	73	123
23	20	47	42	132
13	12	29	32	86
15	10	19	21	65
0	0	1	13	14
11	11	30	61	113
15	11	32	29	87
18	15	26	88	147
17	14	35	54	120
8	8	22	81	121
20	16	34	46	116
28	20	72	212	332
2	2	9	16	29
26	20	54	127	227
20	18	31	32	94

## RAW DATA (Continued)

SUB- JECT	SEX	MOTOR FLU.	MOTOR ORIG.	MOTOR CREAT.	V. FLU.	V. FLEX.	V. ORIG.	V. CREAT.
45	M	17	6	23	53	29	31	113
46	M	9	0	9	19	14	4	37
47	M	24	2	26	33	24	35	92
48	M	22	4	26	57	27	39	123
49	M	22	8	30	55	28	56	139
50	M	18	6	24	73	34	60	167

## RAW DATA (Continued)

F. FLU.	F. FLEX.	F. ORIG.	F. ELAB.	F. CREAT.
20	19	43	64	146
11	11	8	30	60
7	7	12	34	60
19	16	36	44	115
17	14	35	53	119
15	13	25	89	142



**APPENDIX D**

**MEAN AND STANDARD DEVIATION FOR BOYS AND GIRLS  
ALL VARIABLES (T SCORES)**

MEAN AND STANDARD DEVIATION FOR BOYS AND GIRLS  
ALL VARIABLES (T SCORES)

VARIABLE	BOYS		GIRLS	
	X	S.D.	X	S.D.
1. Verbal Fluency	50.31	9.87	49.29	11.12
2. Verbal Flexibility	50.35	7.62	50.33	11.05
3. Verbal Originality	50.12	10.78	49.08	11.19
4. Verbal Creativity	48.77	11.93	47.91	13.43
5. Figural Fluency	48.69	10.70	54.08	7.90
6. Figural Flexibility	47.88	11.29	50.25	7.56
7. Figural Originality	49.62	10.84	50.92	7.48
8. Figural Elaboration	52.50	11.71	48.08	7.83
9. Figural Creativity	54.35	11.46	52.88	6.91
10. Motor Fluency	50.27	11.57	47.75	11.75
11. Motor Originality	49.58	12.30	45.17	7.91
12. Motor Creativity	52.12	10.04	48.46	8.79