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An analysis of two instruments for measuring divergent thinking in young children

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Abstract

For years, many educators have expressed an interest m, a concern for, and recognized a need for research in the area of creativity. Indeed, even those not associated with the field of education have shown concern for the nurturance of creativity in children. Starkweather (1971) quotes the following: "The best plaything for a child is not a splendid and complex rattletrap, but some simple and rough thing which may be applied to various uses and purposes, and aid to stimulate invention and contrivance" (Godey's Lady's Book, 1859). To study creativity, then, educators must integrate creativity theory and testing with child development theory to discover ways to determine which children are indeed creative. More important, they must develop an awareness of practical methods that can be implemented to nurture and enhance creative potential, for "all persons possess creative ability" (Guilford, 1950, p. 446).

AN ANALYSIS OF TWO INSTRUMENTS FOR MEASURING DIVERGENT THINKING IN YOUNG CHILDREN

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CHAPTER I

THE PROBLEM

Introduction

For years, many educators have expressed an interest in, a concern for, and recognized a need for research in the area of creativity. Indeed, even those not associated with the field of education have shown concern for the nurturance of creativity in children. Starkweather (1971) quotes the following: "The best plaything for a child is not a splendid and complex rattle-trap, but some simple and rough thing which may be applied to various uses and purposes, and aid to stimulate invention and contrivance" (Godey's Lady's Book, 1859). To study creativity, then, educators must integrate creativity theory and testing with child development theory to discover ways to determine which children are indeed creative. More important, they must develop an awareness of practical methods that can be implemented to nurture and enhance creative potential, for "all persons possess creative ability" (Guilford, 1950, p. 446).

While research in the area of creative thinking has increased over the last two decades, many problems still remain to be resolved. Some of these problems include the development of instruments which are valid and reliable, and addressing questions of the effects of variables on the

creativity of individuals. Another problem area is that little attention has been paid to creativity in young children, with two opposite views being hypothesized: (a) all young children are creative because it is "natural" at their age, or (b) none are creative in the sense of producing significant contributions to society (Moran, Sawyers, Fu, & Milgram, 1982). Either view has been cited as a reason for not studying creativity among young children. Only recently have researchers begun to look at the concept of creativity as it is manifested in young children, together with the problems inherent in working with preschoolers.

In a review of literature, only two instruments for measuring divergent thinking in young children have appeared with regularity: the Multidimensional Stimulus Fluency Measure (Moran, Milgram, Sawyers, & Fu, 1983b) and Thinking Creatively in Action and Movement (Torrance, 1981). This paper will look at the development of these two instruments and their usefulness in measuring ideational fluency in early childhood.

Statement of the Purpose

The purpose of this study is to examine the literature concerning two tests of divergent thinking which have been developed during the last ten years. These instruments, the

Multidimensional Stimulus Fluency Measure and Thinking Creatively in Action and Movement, have been designed for children under the age of eight years.

Statement of the Problem

Through a review of literature, this researcher will evaluate two instruments which have been developed to measure divergent thinking in young children. Three questions will be addressed; they are the following:

Are instruments which have been developed for measuring divergent thinking in older children and adults appropriate and valid for young children?

How can creativity in the form of divergent thinking be measured in children under the age of eight?

What are the problems encountered in measuring divergent thinking?

Limitations of the Study

This study was limited to a review of literature which was published in the last 30 years. A second limitation of this study was the area of early childhood, which was considered to be birth through age eight. The review was also limited to a discussion of divergent thinking, one facet of creativity, and to two of the many instruments which have been developed to

measure divergent thinking in young children, the Multidimensional Stimulus Fluency Measure and Thinking Creatively in Action and Movement.

Definition of Terms

For the purposes of this study, the following definitions will be used:

Ideational fluency--the total number of ideas produced (Torrance, 1974);

Flexibility--the ability to produce different types of ideas (Torrance, 1974);

Divergent thinking--the ability to mentally search for material that is only loosely related to what is already known (Guilford, 1967);

Originality--the production of an idea which is reproduced by less than 5% of the subjects participating in the study (Torrance, 1974);

Imagination--an indication of personal involvement, interpretation, and elaboration of an assigned task (Torrance, 1981);

Instances task--the generation of names of items which have a particular characteristic (Wallach & Kogan, 1965);

Unusual Uses task--the generation of uses for common objects (Wallach & Kogan, 1965);

Pattern Meanings task--the generation of names of objects which could possibly be represented by a three-dimensional styrofoam form (Starkweather, 1971);

How Many Ways? task--the ability to move in alternate ways (Torrance, 1981);

Can You Move Like? task--the assuming of roles of animals or objects (Torrance, 1981);

What Other Ways? task--the invention of alternate ways of accomplishing a particular request (Torrance, 1981);

What Might It Be? task--the generation of uses for common objects (Torrance, 1981).

CHAPTER II

REVIEW OF THE LITERATURE

Introduction

This review of literature will first discuss Piagetian theory of cognitive development, with emphasis on the pre-operational stage, which deals with young children. The next section will look at the study of creativity, especially the facet of divergent thinking. This will be followed by the historical development of each of the two instruments currently available for measuring divergent thinking in young children, the Multidimensional Stimulus Fluency Measure and Thinking Creatively in Action and Movement. The next section will discuss validity and reliability of these instruments, and the final section will examine the implications of these tests for professionals.

Piagetian Theory of Development

Stage Theory

Piaget (1970) described four global stages of cognitive development in his theory of development. The stages were the sensorimotor, preoperational, concrete-operational, and formal-operational. The progressive development of cognitive stages and mechanisms whereby the mental processes of one

stage are transformed into those of the next stage is fixed; it cannot be altered by environmental influences. The development can be accelerated or retarded by differences in the child's environment, but the steps will be chronological (Brainerd, 1978).

The sensorimotor stage ranges from birth to approximately age two. At this stage of development, internalized thinking processes are absent and only overt behavior is apparent in the child. The preoperational stage occurs between ages 2 and 7, at which time internalization of overt action schemes occurs, and cognitive processes are basically intuitive. The next stage, concrete-operational, is evident between the ages of 7 and 11, when thought processes become rigorous and logical, but are not yet abstract. The final stage, formal-operational, occurs from age 11 through adulthood, and this is the stage when fully abstract thought is possible.

Factors which affect development are maturation, the experience of the physical environment, and the action of the social environment (Piaget, 1970). Physical maturation occurs at different rates for different individuals, and this difference will affect cognitive development. The child will gain experience through contact with the physical environment in three possible ways: through exercise--the child exerts action

on objects, during which no knowledge is necessarily constructed; through physical experience--the child extracts information from objects through his or her manipulation; through logicomathematical experience--knowledge is based, not on physical properties, but on properties resulting from actions on the object. The stages of cognitive development are accelerated or retarded depending on the social environment the child experiences, such as cultural and educational factors.

Preoperational Stage

According to Brainerd, the second of Piaget's four stages of cognitive development is the one about which we know the least. The preoperational stage, compared to the other stages, is defined in terms of ". . . absence of certain abilities. . ." (Brainerd, 1978, p. 95), and is regarded as preparation for the "operations" or mental functions that result from overt behavior. He stated that the cognitive processes of preschoolers are not operations; mental representations of actions are present, but logical rules of organization and structure are not present. Each child will construct his or her own rules of organization or structure from personal experiences; both children and their environments are necessary for learning to occur.

Both physical and logicomathematical knowledge are derived from action, and objective knowledge--knowledge of an object--is acquired through interaction between the child and the object. Active manipulation of materials is critical for thinking and acquisition of the three types of knowledge. Objective knowledge, especially, should facilitate creative and original responses. Theoretically, then, young children who lack opportunities for a wide variety of haptic experiences would be less creative. Familiar stimuli, as compared to less familiar stimuli, maximized the number of responses in a study by Sawyers, Moran, Fu, and Milgram (1983).

Verbal representations should be illustrated with concrete demonstrations, so that children will be able to construct their knowledge from manipulaton of the stimuli. For example, Piaget (1977) found that children were able to reproduce a series of buttons best when they were allowed to do the action themselves, rather than merely looking at the model series of buttons or watching an adult perform the task. Novelty or invention is the result of operational structures being constructed, not merely discovered, in the child's activities (Piaget, 1970).

Divergent Thinking

Defining the Construct

Different methodological approaches produce different definitions for creativity. These approaches include the following: exhaustive lists of particular personality traits, chronological stages, vertical layers, personal reports, and types of thinking (Hallman, 1981). Because types of thinking are most visible in this writer's review of the available literature, that approach will be the one pursued in this paper. Ideational fluency has received more attention than any other component of creativity, and most creativity instruments use ideational fluency as a major variable (Getzels & Jackson, 1962; Moran et al., 1982; Torrance, 1974; Wallach & Kogan, 1965).

One of the first hurdles to overcome was defining the construct of creativity. Creativity can be a product or a process (Dudek, 1974), a general ability or a rare one. It can be nonconformity; it can be "true, generalizable and surprising" (Torrance, 1974, p. 8); it can be manifested in levels--simple to original (Torrance, 1974). Guilford (1967) states that creativity deals with fluency, flexibility, and elaboration, and that creative thinking falls into two categories: divergent-production abilities, and transformational abilities, which is the revision of the "known" to produce new forms and patterns. Creativity is the ability to produce unique and effective

formulations to problems (Cohen & Oden, 1974). Wallach (1970) states that ". . . creativity seems to be a cognitive talent which concerns a person's ability to produce a large number of ideas in response to a given task constraint--relevant, yet unique or unusual. . ." (p. 1240).

Ward (1968) operationalized creativity as the ability to produce a large number of ideas, many of these unique, appropriate to simple problem requirements. To some, creativity is equivalent to divergent thinking (Dellas & Gaier, 1970; Freeland & Moran, 1987; Guilford, 1967). Guilford (1967) states that creativity consists of five attributes--fluency, flexibility, redefinition, sensitivity to problems, and originality--which together make up divergent thinking. Dellas and Gaier (1970), also looking at creativity from this viewpoint, defined divergent thinking as that which occurs ". . . where a problem has yet to be defined or discovered, and where no set way of solving it exists. . ." (p. 56). These authors stated that a criterion for meeting this definition was that creativity can only be recognized through some form of production or performance.

Freeland and Moran (1987) more recently defined divergent thinking as a ". . . process of searching for material that is only loosely related to what is already known so the mind is free to think in several directions. . ." (p. 5). Wallach

and Kogan (1965) defined divergent thinking as thinking in different directions, sometimes searching, sometimes seeking variety. To Cropley (1967), divergent thinking was concerned with the production of large numbers of new ideas, and creative thinking occurred when the boundaries of the "known" were first mastered through convergent processes, and then extended by the application of divergent processes. Cliatt, Shaw and Sherwood (1980) defined the construct as ". . . the generation of many appropriate responses to a question. . ." (p. 1061).

In the past, some researchers have defined the construct of creativity by stating that what is measured by their instrument is creativity. This leaves the reader with the dilemma of sorting through studies trying to find those with concurrent definitions in order to compare "apples with apples." While research on creativity has become more popular, and an increasing number of studies have been done in the area, little has been done in the way of replications. Even though researchers are looking at more and increasingly refined variables regarding creativity research, each is in essence "an island unto itself." Because of this, it is difficult to generalize any studies to larger populations, or to integrate research in various areas.

Another major problem of studying creativity has been the lack of criteria to validate the measures used. The development of tests of creativity which are valid and reliable, and which agree on the construct examined have become more common, the most noteworthy to date being the Torrance Tests of Creative Thinking (Torrance, 1974). This instrument tests creativity in subjects kindergarten age through adult in terms of three areas: fluency--the total number of ideas produced, flexibility--the ability to produce different types of ideas, and originality--the ability to produce nonobvious, yet appropriate ideas. Torrance stated that creativity is a natural human process involving strong human needs:

> 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 (p. 8).

Different abilities are involved in remembering and reproducing information than those involved in recombining portions of information to produce new ideas. Cropley (1967) hypothesized that there may be an IQ threshold below which divergent thinking processes cannot operate. Below a certain

cut-off point, effective creative functioning began to depend on factors other than merely IQ. Various research studies have shown a high correlation between creativity and intelligence below approximately 120 IQ; above that level of intelligence the correlation dropped off to near zero, and the variables were nearly independent (Birren, Kinney, Schaie, & Woodruff, 1981; Dellas & Gaier, 1970; Godwin, 1984; Gowan, 1981; Moore & Sawyers, 1987; Ward, Kogan, & Pankove, 1972).

Necessary and Sufficient Conditions

Attitude, more than IQ, is the greatest influence on creativity, according to Birren et al. (1981). Hallman (1981) listed the following as the necessary and sufficient conditions for creativity:

1. It involves a whole act, or unitary instance of behavior--this condition projects a "connectedness" between cognitive processes and physical actions.

2. It terminates in production of distinctive objects or forms of living--this condition is called "originality".

3. It evolves out of certain mental processes--"nonrationality" denotes the use of divergent rather than convergent mental processes.

4. It covaries with specific personality transformations or traits--Hallman terms this condition "self-actualization", since these traits would vary from one individual to another.

5. It occurs within a particular kind of environment--"openness" of environment seems to encourage creativity more than other types of settings.

Moran et al. (1982) discussed related issues in measuring creativity which involve several aspects of test administration and environment. The setting for the administration can make a noticeable difference, so the examiner needs to control for extraneous materials and stimuli, as well as to develop local norms. Examiners need to establish rapport with the subjects, perhaps by spending time with the children before testing, and thereby possibly eliciting more responses. The Uses task elicited the fewest responses of the test items used, except where a three-dimensional object was available for the subjects' manipulation, indicating that the dimensionality of the stimuli was important. In this study, preschoolers elicited more original responses (60.1%) than older children (25-33%), showing that age, and perhaps socialization of the schools, may have been factors.

Creativity can have many definitions, depending on a particular author's approach to the construct. Likewise, creativity in an individual can apparently be affected by many

variables. All these things have compounded the difficulties encountered in trying to study a particular population in terms of creative abilities or potential.

Development of the Instruments

Multidimensional Stimulus Fluency Measure

Wallach-Kogan Type Tests

Up until the late sixties, the most common and well-known tests of creativity were the Torrance Tests of Creative Thinking and Guilford's battery of tests (Wallach, 1970). These tests were group administered, which, Wallach hypothesized, put unwarranted pressure on children in terms of competition with the rest of the class. The tests had a prescribed time limit (implicit if not explicit) which also presented pressures on the test-takers which could inhibit novel and unconstrained thinking. Wallach and Kogan (1965) recommended ". . . an individual situation, free from the feeling of being under examination, having ego-centered orientation rather than task-centered orientation, and fostering a 'play' atmosphere which is evaluation free and driven by intrinsic motivation. . ." (p. 19).

They based their conclusions on the work of Mednick (1962), who projected a model of an Associative Response Hierarchy. This model stated that response rates would decline over time for all subjects, with a higher initial response rate for

uncreatives; all subjects would give the usual, more mundane responses first, then more creative, unique responses later, with creatives giving many more original responses than uncreatives. According to Wallach and Kogan (1965), since a creativity test was not a test of ability, no time limit was needed; indeed, time allowed should be ample for extension or mediation--time for those unique responses to appear. For this reason, Wallach and Kogan suggested that subjects should be allowed to continue to respond until the subjects themselves indicated that they were finished. This response hierarchy has been supported by research (Milgram & Rabkin, 1980; Moore & Sawyers, 1987; Moran et al., 1983b; Wallach & Kogan, 1965; Ward, 1969; Ward, Kogan & Pankove, 1972).

The Wallach and Kogan study (1965) tested 151 children from New England schools, average age 10 years 7 months. The fifth grade classroom teachers administered the tests which measured two variables--the number of unique responses (originality) and the total number of responses (fluency)--in each of five areas: Instances, Alternate Uses, Pattern Meanings, Line Meanings, and Similarities. Their results showed a high intercorrelation between the five areas; that is, a child who displayed a high number of responses in one area generally reproduced that high level in other areas. Likewise, a child who produced a paucity of responses in one of

the the five tasks would repeat that low number of responses in the other areas.

Milgram and Rabkin (1980) studied 4th, 7th, and 12th graders using a Wallach and Kogan battery of tests with unlimited time for responses. They scored both the total number of responses and the original (given by less than 5% of the subjects) responses. The number of responses increased with age; children over 12 years of age produced a higher level of original responses than the younger children, but not as high as the oldest children, possibly due to the broader experience base of the older students.

Wallach and Kogan style test batteries developed by researchers seemed to be appropriate in allowing subjects to produce the highest possible response rate. Their theories based on Mednick's Response Hierarchy have been supported in research, and have affected the development of instruments for testing creativity over the last two decades.

Variations in Stimuli

Familiarity of stimuli. Familiarity of stimuli seemed to affect the results of a creativity test for children. The use of two-dimensional stimuli in the form of drawings in a Wallach and Kogan type instrument resulted in extremely low response rates for young minority children during the Unusual Uses task,

perhaps because the simuli were unfamiliar to the subjects (Busse, Ree, Gutride, & Alexander, 1972). Use of more concrete, simple and familiar stimuli produced higher response levels (Moran et al., 1983a; Moran et al., 1982; Sawyers et al., 1983; Ward, 1968; Williams & Fleming, 1969). .Goodnow (1969) stated that with young children, suggested uses for an object ". . . seem to be not so much created as recalled. . ." (p. 210). Individual variations resulted from the way a particular child sampled from this pool of experiences and defined an acceptable use.

Manipulation of stimuli. Because of the high correlation between tasks in the Wallach and Kogan instruments, and also because of her interest in extending creativity research to young children, Starkweather (1964) adapted the Wallach and Kogan tests by dropping two of the tasks (Line Meanings and Similarities), and by changing the Pattern Meanings task from two-dimensional stimuli to three-dimensional stimuli. She hypothesized that a high intercorrelation between tasks would make a three task test of creativity as valid as the five task instrument had been. This shorter version would be more appropriate for young children because of their shorter attention span and the tendency to tire more easily than older children.

The opportunity to manipulate the stimuli also improved the appropriateness for young children. The use of two-dimensional stimuli, in the form of drawings on paper used by Busse, Blum, and Gutride (1972) in a Wallach and Kogan type instrument resulted in extremely low response rates for young minority children. Starkweather's (1964, 1971) contention that this type of task was inappropriate for preschool children led her to develop three-dimensional stimuli which provided a haptic experience. Young children tested using both types of stimuli produced a higher response level using the manipulative stimuli than they generated using the two-dimensional stimuli. Starkweather concluded that manipulation of the stimuli was needed to enhance the number and quality of responses when testing young children's fluency. These results were well supported by later research (Dansky & Silverman, 1973; Fu, Kelso, & Moran, 1984; Goodnow, 1969; Harrington, 1987; Moran et al., 1982).

Dimensionality of Stimuli. Moran et al. (1983b) agreed with Starkweather's hypothesis that the traditional means of studying creativity in older children were not applicable to young children. They stated that researchers were often not sensitive to a young child's perspective and view of the world. Their study examined two-dimensional versus three-

dimensional materials for testing ideational fluency in young children. The three-dimensional tasks elicited more responses in every case regardless of the stimulus set. The results of this study showed that stimuli which provided haptic experiences generated more responses from young children. The authors concluded that when an object was seen and handled, far more unique uses were generated. They argued that instruments used for measuring original thinking in elementary school students and adults were of limited use with preschoolers. The authors hypothesized that the three-dimensional forms may provide perceptual clues not available in the two-dimensional stimulus, and thus may promote the generation of more responses. A more recent study, however, indicated that handling the stimulus seemed to be the most important variable when three-dimensional objects and photographs of those same objects were used as stimuli for the Pattern Meanings Task (Tegano & Moran, 1988).

Description of the Multidimensional Stimulus Fluency Measure

The Multidimensional Stimulus Fluency Measure (MSFM), developed by Moran et al. (1983b), uses three tasks with three items per task to index ideational fluency:

1. The Unusual Uses task involves generating uses for common objects (box, paper, spoon).

2. The Instances task asks the subject to name all the items which have a particular characteristic (things which are red, round, make noise).

3. The Pattern Meanings task asks the subject to look at a pattern and name all the objects it could possibly represent (styrofoam forms named by the authors "half", "foot", and "boat", all painted various colors) (Godwin, 1984). (See Appendix)

Validity and Reliability

The Multidimensional Stimulus Fluency Measure has not been reviewed in the Ninth Mental Measurements Yearbook, published in 1985 or in the supplement. All information about this instrument has been gathered through empirical studies done during the last five years, both published and unpublished.

Studies testing the validity and reliability of the MSFM have been reported by only a few people. Godwin's thesis (1984) explored these areas in an attempt to validate the MSFM. Complete written instructions for scoring were included, along with a master list of responses for each task from previous studies and the frequency of each response given. Repeat responses, those which were the same as a previous response or a synonym, were scored zero. Bizarre

responses, those which were clearly not congruent with the stimulus item, were also scored zero.

Godwin related that the construct validity of the Wallach and Kogan model was demonstrated by the fact that (a) scores on ideational fluency tasks were distinct from intelligence; (b) tasks which measure ideational fluency correlated more highly with each other than with measures of intelligence; (c) a relationship existed between the quantity and the quality of ideas such that "'many' leads to 'unique'" (p. 2); and (d) a response heirarchy was evident--popular, common responses emerged early, while creative, original responses emerged later. The MSFM appeared to meet these criteria, as did a shortened form consisting of six items, using two items per task.

Scores on the MSFM for children between ages 4 and 7 appeared to be relatively stable, r = .54 (Godwin, 1984; Moore & Sawyers, 1987). Godwin, however, stressed that expansion of test-retest reliability was needed. More studies demonstrating concurrent and predictive validity were called for. Most important, Godwin stated the need for an expansion of the normative data base for scoring original responses in terms of obtaining an increased number of children within a truly representative sample.

Predictive validity is another area where further study is needed. This writer located only one study which attempted to measure the predictive validity of the MSFM. Moore and Sawyers (1987) found that the MSFM yielded a fairly high correlation (r = .54) between the scores of children tested at age 4 and again at age 7 or 8.

Thinking Creatively in Action and Movement

Torrance Tests of Creative Thinking

From her testing in the 1920s, Andrews (1930) concluded that creative imagination exists in varying degrees in all normal preschool children. She felt that the skills young children learned early and enjoyed were generally the creative ones: imagining, questioning, singing, dancing and storytelling. Andrews also concluded that these were the very skills which were ignored and unused when children entered elementary school. Her observations of 2 to 6 year olds included imaginative play, imitation, experimentation, transformation of objects, transformation of animals, acts of sympathetic dramatization, imaginary playmates, fanciful explanations, fanciful stories, new uses of stories, constructions, new games, extensions of language, appropriate quotations, leadership with plan and aesthetic appreciation. Through her many studies, Andrews found that the total creative imagination scores were

highest for children between 4 years and 4 years 6 months of age, with a sudden drop at about age 5 when children entered kindergarten.

Building on these early experiments and other research, Torrance (1974) developed tests of creative thinking that would extend down to 5 year olds, the Torrance Tests of Creative Thinking. These tests have been used throughout the last three decades and have been the basis for the majority of creativity studies since that time.

Development of an Instrument for Use with Young Children

While the Torrance Tests of Creative Thinking have been widely accepted and used, these tests proved to be only marginally successful with 5 year olds, and were unsuitable for 3 and 4 year olds (Torrance, 1981). Torrance made serious efforts to test creativity in preschoolers beginning in 1966 when he used a Mother Goose Problems Test, a Construction Test (using Lego blocks), an Originality Test calling for unusual images using different shaped wooden blocks, a Question Asking Test calling for questioning responses to Mother Goose stories, prints and toys, and a Just Suppose Test based on original drawings of unlikely situations. These tests relied heavily on verbal responses and showed disappointing results.

Through the 1960s and 1970s, Starkweather was developing her instruments for assessing creativity of preschool children, and these also influenced Torrance. Repeated observations of young children in a preschool setting brought Torrance to the development of four guidelines for designing instruments for measuring creativity in young children: (a) tasks should permit responses in the most practiced modality; in young childen he felt this modality was the kinesthetic one; children in the 3 to 5 year age range especially may be unable to describe verbally the rich images in their minds; (b) tasks should contain warm-up and motivation common to the experiences of children 3 to 8 years old; (c) the instrument should sample the kinds of creativity important in the lives of these children; that is, it should make sense to them; and (d) the instrument should be easy to administer and score (Torrance, 1981).

"Dependence on verbal and figural modalities will severely limit opportunities for creative responses in children ranging in age from three to eight" (Torrance, 1981, p. 3). Torrance himself realized that young children's development was such that trying to measure creativity by standards and procedures developed for older children and adults would prove to be inappropriate and invalid. Because of this realization, Torrance developed the Thinking Creatively in

Action and Movement (TCAM) as a means for trying to quantify divergent thinking in young children. He stated that these children had only marginal or emerging skills for expressing their creativity through words or drawing, that another modality was necessary to allow for reaching the greatest potential, and that the kinesthetic modality was most appropriate for the age group.

Description of Thinking Creatively in Action and Movement

Thinking Creatively in Action and Movement was developed to be administered to young children in 10 to 30 minutes. The TCAM was to be administered individually, with four subtests: (a) How Many Ways? which measured the child's ability to move in alternate ways; (b) Can You Move Like? in which the child was asked to assume roles related to animals or objects; (c) What Other Ways? in which the child was to invent ways to put a juice glass in the wastebasket; and (d) What Might It Be? which asked for unusual uses for a paper cup. These four subtests yielded three scores--fluency and originality were measured by three of the activities, and the fourth activity (Can You Move Like?) yielded an imagination score.

Fluency was measured by simply counting the number of responses. Originality was measured by comparing the child's

responses to the statistical frequency of responses as recorded in the scoring guide lists. The imagination score was the result of a 5-point Likert-type scale marked for each of the six specific movement tasks in the Can You Move Like? subtest.

Both verbal and/or action responses were to be recorded by the examiner. A minimum time limit was not prescribed; however, the examiner was cautioned to avoid fatigue of the young child by not allowing the test situation to last too long. The tasks could be administered in a play-oriented atmosphere, which would encourage maximum performance, especially if the examiner actively participated with the child when instructions were given and during the introductory phases of each activity. Since the responses called for were common to all American children prior to age 3, the test was said to be fair for all races, cultures, and socioeconomic backgrounds (Renzulli, 1985).

Torrance stressed the importance of the warm-up for preschool children in order to motivate them properly. He stated that the need for this warm-up period made it necessary to rely on the entire battery of tests instead of selecting only a few of the activities. Because a child might not really become involved until the third or fourth activity, Torrance reasoned that using an individual task would result in unreliable and invalid scores.

Mean standard score for the TCAM was 100 with a standard deviation of 20 (Torrance, 1981). Directions for scoring were clear and easy to follow since a list of sample responses was included in the guide (Rust, 1985). Original scores ranged from 0 to 3 for each response, depending on the frequency from the statistical tables. Norms were based on tests of 1,896 children ages 3-8 in eleven states and Guam, with directions for converting raw scores to standard scores.

Validity and Reliability

In the Administration, Scoring and Norms Manual, Torrance (1981) reported inter-rater reliability as very high, ranging from .90 to .99. Studies of test-retest reliability also yielded results which were quite high; intercorrelations between the four separate subtests ranged from .58 to .79, and .84 overall. Other studies showed minimal relationship with intelligence scores (Renzulli, 1985). These research results, then, apparently have met three of the four standards for construct validity mentioned by Godwin (1984): scores were distinct from intelligence, task intercorrelations were higher than with IQ, and quality and quantity of ideas were related in that the more responses given, the better the chances of finding original responses (Torrance, 1981). No mention was made, however, of a response hierarchy in the studies reported

by Torrance using the TCAM, although such a hierarchy may have been present.

No racial or sex biases were found in results of studies using the TCAM as reported by Torrance in the TCAM norms manual. Troiano and Bracken (1983) concluded that creative abilities were influenced little by heredity and greatly by life experiences and enculturation, which echoed earlier studies (Davenport, 1967; Pezzullo, Whorsen, & Madans, 1972; Richmond, 1968; Torrance, 1981; Tsunoda, 1978; Westra, 1978). Types of preschool background, economic status, and family or cultural experiences were found to affect scores in these studies; early childhood settings which valued creative movement, problem solving, sociodrama and a creative curriculum produced children with higher scores. These results indicated that racial differences in the form of enculturation rather than genetics probably exist.

Correlations with various creative characteristics were also reported by Torrance (1981). Socioemotional development, self-concept, cooperation, sense of humor showed varying degrees of correlation with TCAM scores. Mental maturity showed no correlation (Torrance, 1981). A separate study by Reisman, Floyd, and Torrance (1981) resulted in no correlation with standard Piagetian tasks which tend to be convergent, but a correlation coefficient of .58 (.001) with

revised Piagetian tasks developed as divergent situations. This study led these authors to conclude that the TCAM significantly predicted cognitive performances that involve some divergent thought.

In his review in the The Ninth Mental Measurements Yearbook, Rust (1985) pointed out some problems with the TCAM. For example, although the test was designed for 3 to 8 year olds, the conversion tables in the manual were only printed for 3-, 4-, 5-, and 6-year olds, with a warning that using the norms for the older children in this age group was not recommended. Also, the manual for showing how to convert the raw scores to standard scores was in error for two of three conversions. A third problem noted by Rust dealt with the possibility of a child earning extra credit (up to 4 points) for "unusual flourishes and choreographing" (p. 1621); however, even an experienced examiner may have had trouble deciding when to award these points, according to Rust. A final problem focused on the How Many Ways? subtest, which did not include specific directions for placing the tape on the floor. Rust stated that a distance of seven feet might motivate a child to produce different responses than a distance of fifteen feet. Rust did note that the test results were positive enough to warrant further experimentation, and that he was not aware of

a better test at that time for assessing creativity in young children.

Troiano and Bracken (1983) questioned the use of an Imagination score since this terminology had not been used on other standardized creativity tests. They felt that elaboration would have been a more consistent and understood variable with a similar meaning. Troiano and Bracken also pointed out that a 0-3 point scale, rather than the 1-5 point scale used, would have been more consistent with other variables in the instrument overall.

Torrance (1981) admitted that the validity of Thinking Creatively in Action and Movement has been fleeting, and that it was difficult to see how a "direct study of validity can be conducted in a meaningful way" (p. 7). His arguments for validity of the instrument relied on scattered evidence reported in the manual, observations of the author, and the rationale presented in the manual. Torrance also requested users of the instrument to communicate validity information to him in an effort to validate the instrument further.

Cross-Validation of Instruments

Tegano, Moran and Godwin (1986) carried out a cross-validation between the Multidimensional Stimulus Fluency Measure (MSFM) and Torrance's Thinking Creatively in Action

and Movement (TCAM). Both of these instruments tested ideational fluency, but through different response modes. While the MSFM required verbal responses to verbal and visual-tactile stimuli, the TCAM required kinesthetic, nonverbal responses to the verbal and visual-tactile stimuli. In other words, the TCAM required children to move and act out their responses in a nonverbal format, although verbal responses were accepted. Although these measures assessed ideational fluency through different modalities, Tegano et al. considered cross-validation to be appropriate since other studies also established construct validity (Erikson, 1977; Reisman, Floyd, & Torrance, 1981; Tegano et al., 1986).

Ideational fluency assessed through the two instruments in this study was not related to IQ as determined by the Wechsler Preschool Primary Scale of Intelligence. This conclusion is concurrent with other studies testing the correlation between IQ and divergent thinking as measured by these instruments (Godwin, 1984; Moore & Sawyers, 1987; Moran et al., 1983a; Moran et al., 1983b; Moran et al., 1982; Moran et al., 1984).

The total fluency scores on these instruments correlated $r = .61$ (.005), and the total originality scores correlated $r = .62$ (.005). The rank order intercorrelations of originality scores among subtests of the MSFM and among total scores of the

TCAM were significant to varying degrees (.35 - .84). This indicated that the subtests measured the same construct, although not always at high levels.

A study by Kershner and Ledger (1985) using the Torrance Tests of Creative Thinking led them to project the concern that some of the subtests in this instrument which rely on verbal abilities may cause questions of construct validity. This concern could also be raised in reference to the MSFM, which relied on verbal responses to the stimuli. The correlations of the MSFM with the TCAM, however, seemed to indicate that sufficient construct validity was present to give the MSFM credence.

Limitations of Divergent Thinking Tests

Validity and Reliability of Divergent Thinking Tests

Research studies done with tests of divergent thinking in general have raised questions about validity and reliability which may also affect in the TCAM and MSFM. Hocevar (1979a) used divergent thinking tests in research which led him to conclude that these types of tests lacked discriminant validity for multitrait multimethod criteria. In other words, intercorrelations between fluency and flexibility in separate tests of divergent thinking were too closely related to allow for distinction between the indices. In a separate study Hocevar

(1979b) found that originality had a reliability coefficient near zero after partialing out variance shared with fluency. Plass, Michael, and Michael (1974) hypothesized from their research that fluency, originality, flexibility and elaboration were separate factors for different tests, but not for separate indices within a single test. Others concluded that fluency and flexibility should be treated as one dimension instead of two (Harvey, Hoffmeister, Coates & White, 1970; Kazelskis, 1972).

Runco's (1986) study yielded similar results among gifted children. He tested 97 intermediate grade gifted children using four Wallach and Kogan type tests (Instances, Uses, Pattern Meanings, and Line Meanings), and results showed that even for gifted children originality and flexibility were not sound and useful indices of divergent thinking and creativity.

All these studies lead the writer to question the validity and reliability of the MSFM and TCAM in terms of discriminating among the fluency, flexibility and originality of responses using these instruments. Treffinger (1985), however, writing about creative thinking tests in general stated, "We must be cautious not to expect too much of any single instrument; most instruments have been developed in the hope of assessing some relevant components of the larger construct of 'creativity'" (p. 1632). Obviously further research

would be necessary to help clarify the issues raised in these studies.

A call for expansion of normative data (Godwin, 1984; Rust, 1985) to help establish validity would seem only to expand the problem, especially in the area of originality. While the development of standardized scores may be useful to measure ideational fluency, local norms may be more appropriate for the other indices of divergent thought. For example, a response which might be unique or original in one area of the country may not be unique in a different location. Answering "a pig" to the request for "something red" in the Instances task on the MSFM would probably not be original in Iowa where Duroc hogs are common. That same response in New York City might be considered original, or it might be considered bizarre and score a zero, depending upon the judge who was scoring the test. In this regard, local norms may be a more effective means of measuring the divergent thinking ability of subjects than using standardized results. Local norms might also aid in controlling variables such as testing environment, socioeconomic status, and examiner differences, which were named as confounding problems by Moran et al. (1982). Perhaps a single score or index using fluency as a basis is the most accurate means of measuring divergent thinking, as recommended by several researchers (Harvey et al., 1970;

Hocevar, 1979a; Hocevar, 1979b; Hocevar, 1979c; Kazelskis, 1972; Runco, 1986). Producing the greatest number of answers, however, may not necessarily correlate with the highest level of creativity. If we can only reliably measure fluency, then divergent thinking tests may not be the best measure of creative thinking at all.

CHAPTER III

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Summary and Conclusions

Over the years of testing cognitive abilities, tests of creative abilities have been almost nonexistent. While the idea of "100 IQ" conjures a relatively clear picture, the idea of "moderate creative" gives us no sense of ability at all. If educators are to develop and nurture creativity in their classrooms, then measures of creativity which are valid and reliable need to be developed and researched, not only for adults, but for young children as well. Empirically testing measures of creativity could help in the development of a theoretical model of creativity which takes into account developmental issues such as stability and continuity (Moran et al., 1982). Discovering and creating conditions that facilitate creative development among young children can only be done through data-gathering instruments, so the need is evident for quantitative instruments of creative thinking.

Piaget (1970) viewed creative thought as an essential component of society:

> How peculiar it is that so many American and Soviet psychologists, citizens of great nations, which intend to change the world, have produced learning theories that

> reduce knowledge to a passive copy of external reality (Hull, Pavlov, etc.), whereas human thought always transforms and transcends reality (p. 714).

If society is to solve the problems of the future, the development of creative thinking in all people is of vital importance. With the trend today toward multiple, short-term careers during a lifetime, a need for greater emphasis on the development of creativity and flexibility is apparent (Birren et al., 1981).

Since 1950, there has been increasing research activity in the area of creativity, but mostly in the areas of product and personality characteristics. Only recently has the process begun to be explored. A continuation of this beginning is vital to the age appropriate instrumentation which will be needed for early identification of highly creative subjects. While the two instruments discussed in this paper were not perfect, they were, in this writer's opinion, the best tools available for measuring divergent thinking among young children.

In order to enhance ability in young children, educators must first be able to recognize this ability. Without instruments to measure creativity in the form of divergent thinking, this recognition is difficult. Young creatives do have personality structures congruent with, but not as sharply delineated as mature recognized creatives, so traits probably

develop fairly early (Dellas & Gaier, 1970). Teachers, however, may not recognize those characteristics without training, so using an instrument which attempts to quantify the ideational fluency of a young child may be the most useful measure for the teacher in the regular classroom.

Recommendations

At the preschool level, the focus on creativity is on the generation of ideas. Along with the recognition and measurement of divergent thinking ability, developing that ability to think divergently is also an essential component in the process of creative problem solving, as well as a challenge for the classroom teacher. Cliatt et al. (1980) showed that divergent thinking can be increased in young children through questioning techniques used by the classroom teacher. For this writer, the Cliatt, Shaw and Sherwood study then elicits the question of whether there exists a ceiling on creativity or whether its limits are only determined by the biological and social background and relative environment of the subjects tested. Cropley (1967) also recognized the importance of the teacher by stating that "creative thinking in students can be fostered by mere contact with a teacher who values and fosters divergent thinking" (p. 87).

Early childhood classrooms must expose children to tasks encouraging alternation between convergent and divergent thinking patterns. Classroom procedures should include problem finding and solving, cognitive flexibility, encourage risk-taking, and self-evaluation. Cropley (1967) listed ten attributes which teachers and parents need to develop in order to foster divergent thinking among children.

1. Value creative thinking.
2. Encourage manipulation of objects/ideas.
3. Develop tolerance of new ideas.
4. Beware of forcing a set pattern.
5. Teach the child to value his/her own creative thinking.
6. Encourage and evaluate self-initiated learning.
7. Make available resources for working out ideas.
8. Develop skills of constructive criticism.
9. Encourage acquisition of knowledge in a variety of fields.
10. Be adventurous-spirited yourself.

Developing, or even valuing these attributes may prove to be an extremely difficult task for many educators.

Children need educational systems that encourage creativity, and "society needs the development of more individuals who will take unusual stances, provide powerful

insights, or uncover rare elements in a situation that other people have missed" (Birren et al., 1981, p. 683). Unfortunately, several factors in American culture have tended to inhibit creativity in children, as delineated by Arasteh and Arasteh (1976). The first factor was success orientation which pushes children to stay within limits in the classroom if they want to succeed, rather than trying the new or unknown. A second factor which hinders the development of creativity begins at approximately fourth grade when the peer group becomes more important in a child's life than do the adults. Teachers themselves provided the third factor, which is the discouragment of exploration, imagination and questioning. Arasteh and Arasteh listed the dichotomy of work versus play which has developed in our society as the fourth factor inhibiting creativity development in children. School and the work done there are not supposed to be fun; learning only comes with hard work. This is the message presented within a philosophy which is common to most public schools.

If the schools are to dispel these inhibiting factors, the environment seems to be critical for creativity. The attitude of teachers, the physical organization of the room, and the techniques and manner of instruction all seem to have a large effect on creativity in the classroom (Birren et al., 1981; Cliatt

et al., 1980; Moran et al., 1982; Torrance, 1981; Troiano & Bracken, 1983).

> To live is to have problems, and to solve problems is to grow intellectually. . . . Creative education. . . aims at a self-starting, resourceful, and confident person, ready to face other kinds of problems. . . . Creativity is the key to education in its fullest sense, and to the solution of mankind's most serious problems (Guilford, 1967, p. 12).

Guilford stated his philosophy for nurturing creativity and divergent thinking very concisely and clearly. This writer agrees, and would only add that creative education must begin with the very young in order to allow children to approach maximum potential.

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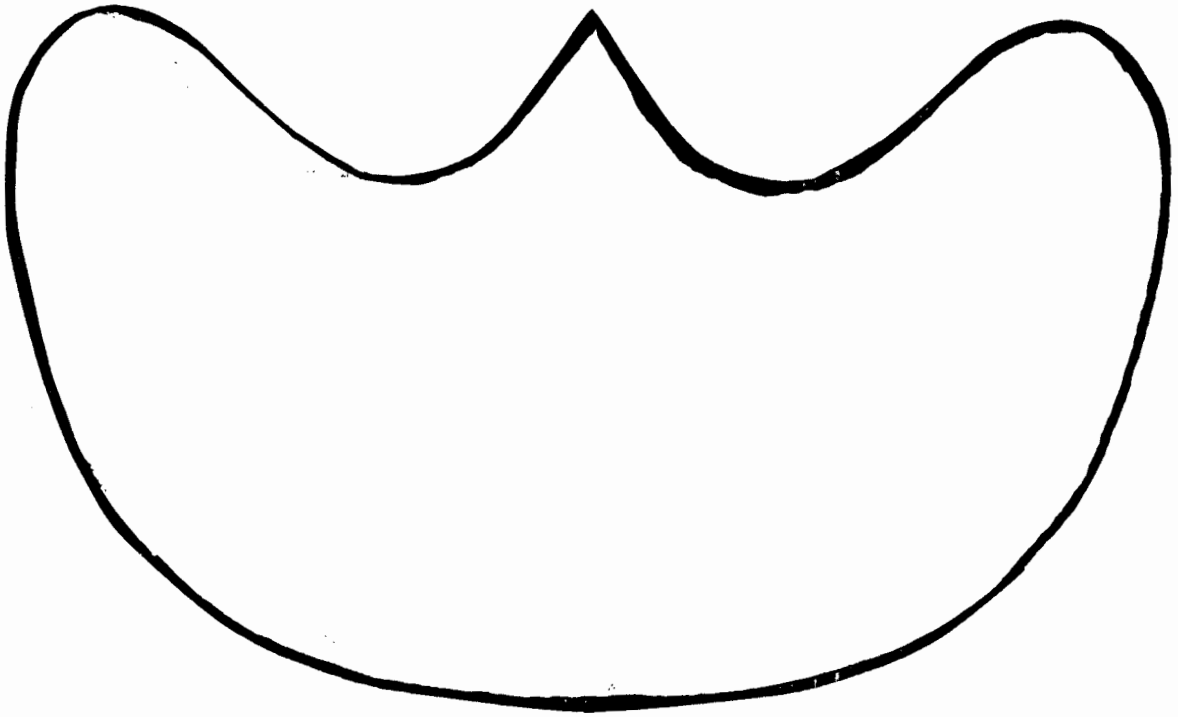
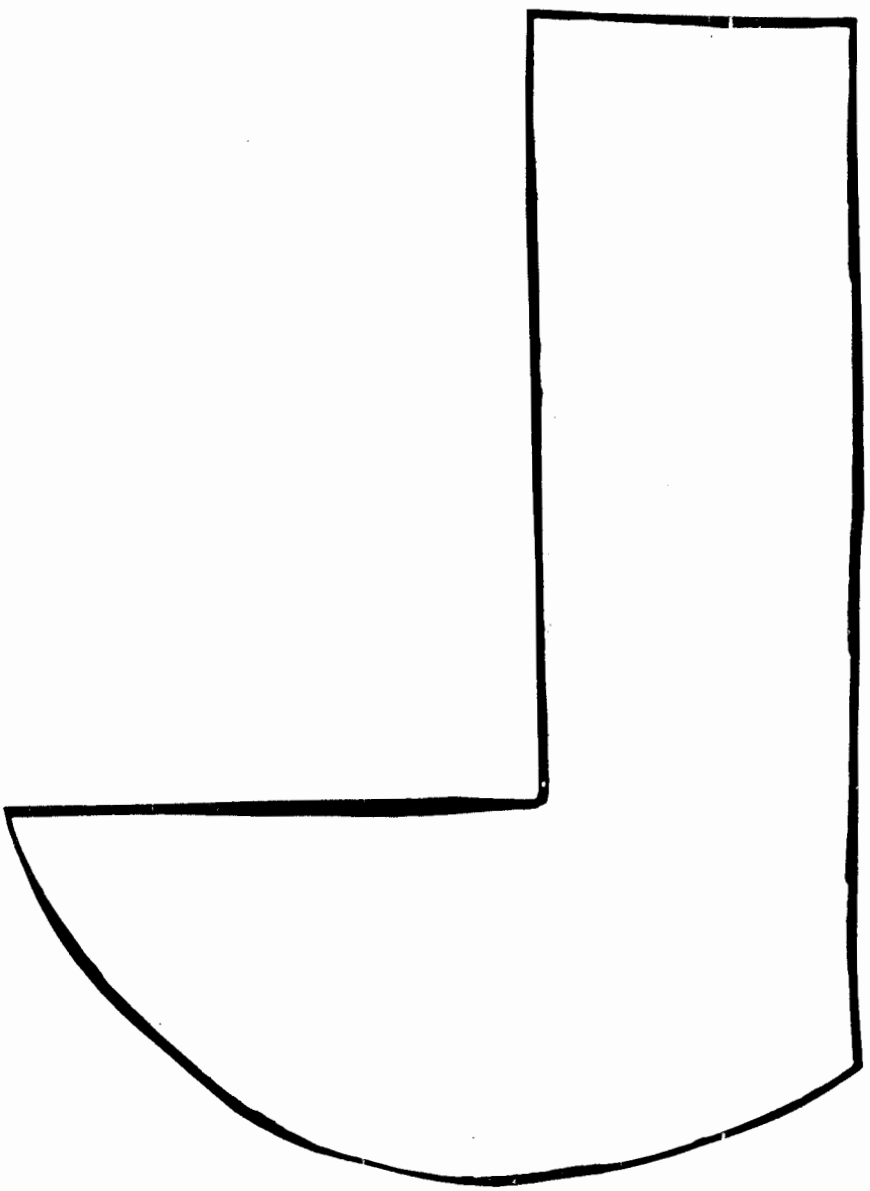
Appendix

Appendix

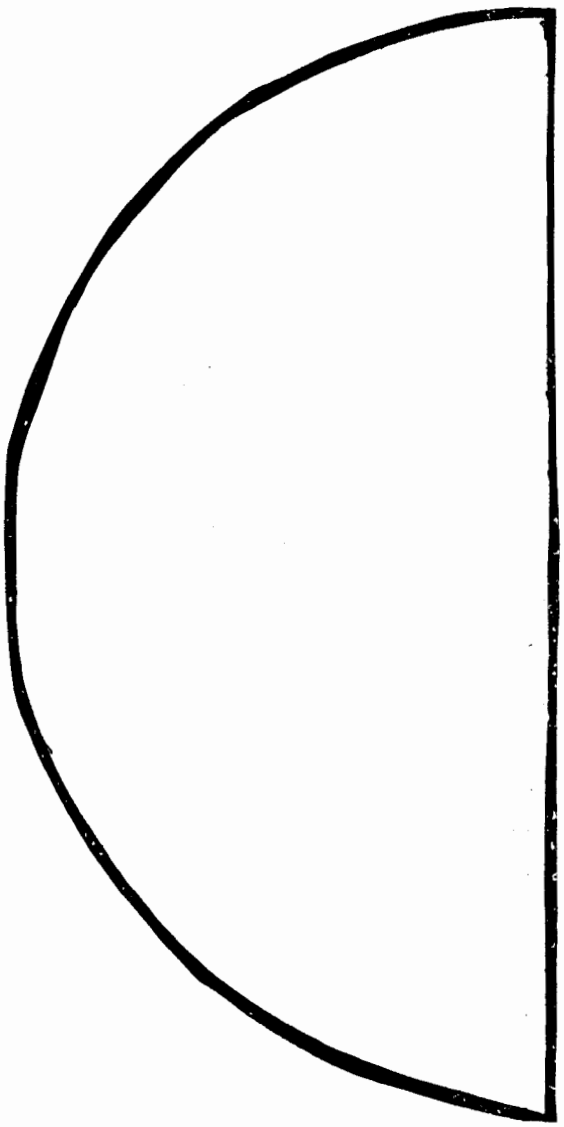
The shapes for the Pattern Meanings task of the Multidimensional Stimulus Fluency Measure are to be cut from 3 centimeter thick styrofoam and painted various colors. The patterns for the three shapes are depicted actual size (Godwin, 1984).



"Boat"--blue



"Foot"--yellow



"Half"--red